

# BSAI SAFE Report December 2006



BSAI Groundfish FMP Team  
North Pacific Fishery Management Council

# **BSAI Plan Team Members (14 Members)**

NPFMC -- Jane DiCosimo (Plan Coordinator)

NMFS (AFSC) --Loh-Lee Low (Chair)  
Mike Sigler (Vice Chair)  
Grant Thompson  
Lowell Fritz  
Kerim Aydin  
Dan Lew

NMFS (Region) Andy Smoker

USF&W -- Kathy Kuletz

ADF&G -- Ivan Vining

Dave Carlile

Univ.Alaska-- Brenda Norcross

WDF&W -- Theresa Tsou

Halibut Comm-- Bill Clark

**2006 BSAI SAFE Reports**  
**Many Contributors**  
**from Various Agencies and Universities**

**33 Authors for Status of Stocks Section**

**96 Contributors to Ecosystems Section**

**12 Authors for Economics Chapter**

**35 Authors presented their reports to the Plan  
Team at its November 13-17 meeting**

# Assessment Theme

## Definition of ABC and Overfishing Levels

Appendix A Plan Team Summary, Page 5

**ABC or Overfishing Levels are derived from Specific Exploitation Rates on some estimated Biomass**

1. Determine Biomass from
  - **Surveys....Trawls, Hydroacoustics, Longline, etc.**
  - **Models.....Mainly Age Structured Models**
2. Determine Exploitation Rates  
(Catch Control Rules of 6-Tier System)
  - **F *overfishing* ..... Example F 35%**
  - **F *abc* ..... Example F 40%**

# Exploitation Rates by Fishing Control Rules

Quality of Information about Population Dynamics  
of the Stocks determine Use Catch Control Rules  
according to 6 Tiers of Data Quality

(Page 5 of SAFE Plan Team Summary in Appendix A)

Tier 1 -- Reliable B, Bmsy, pdf of Fmsy

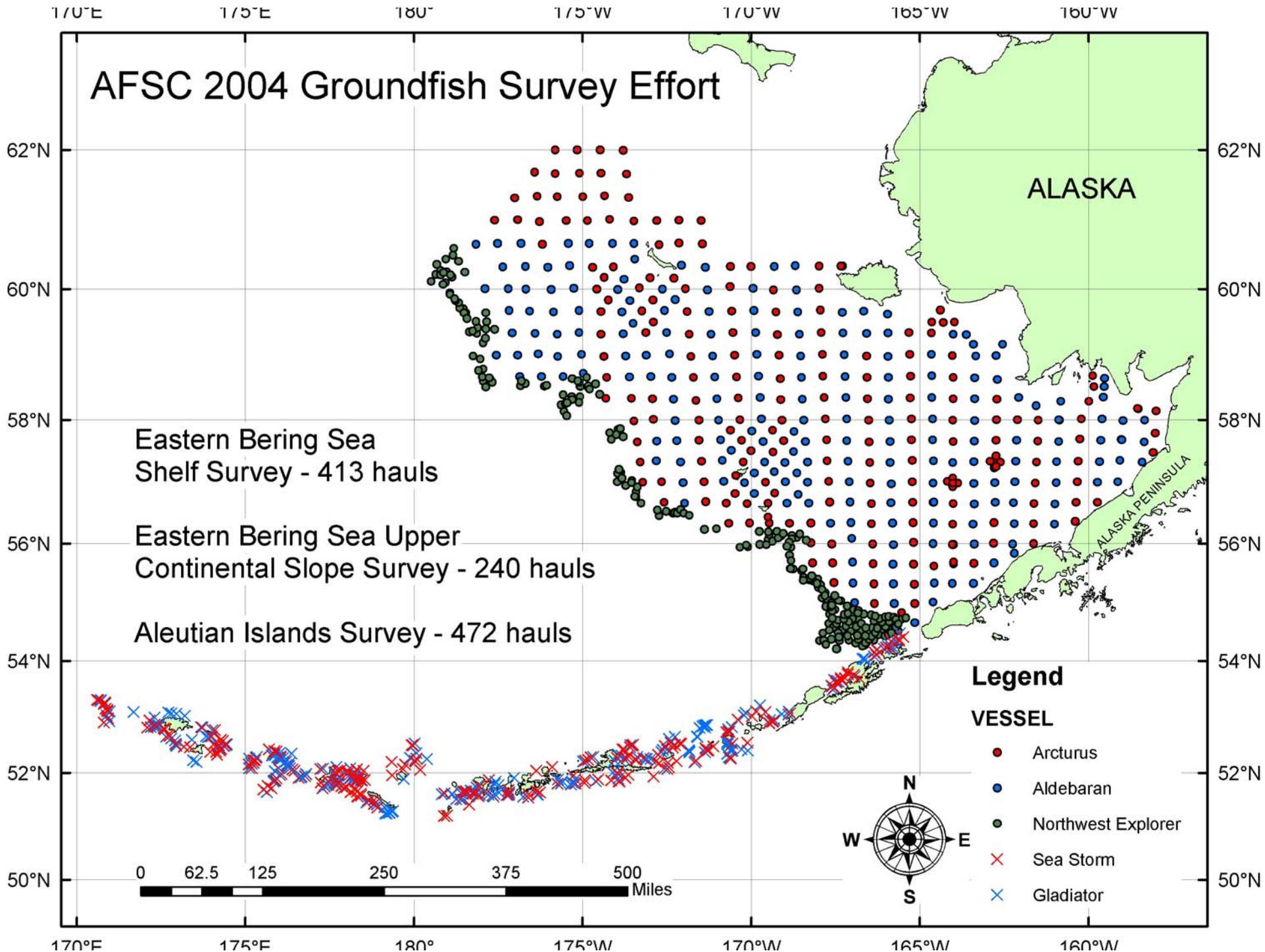
Tier 2 -- Reliable B, Bmsy, Fmsy, F35, F40

Tier 3 – reliable B, B40, F35, F40

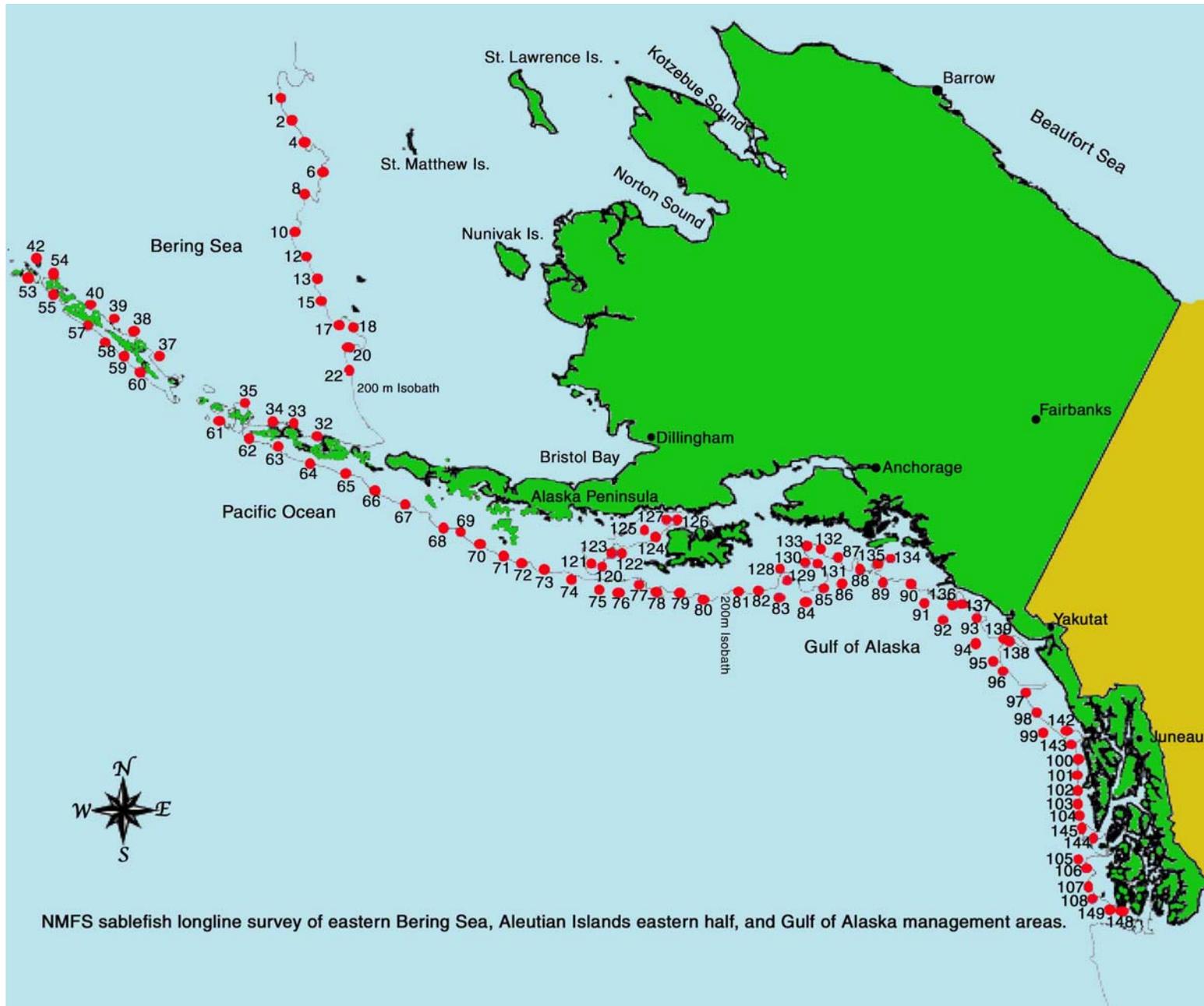
Tier 4 – reliable B, F35, F40

Tier 5 -- reliable B and M

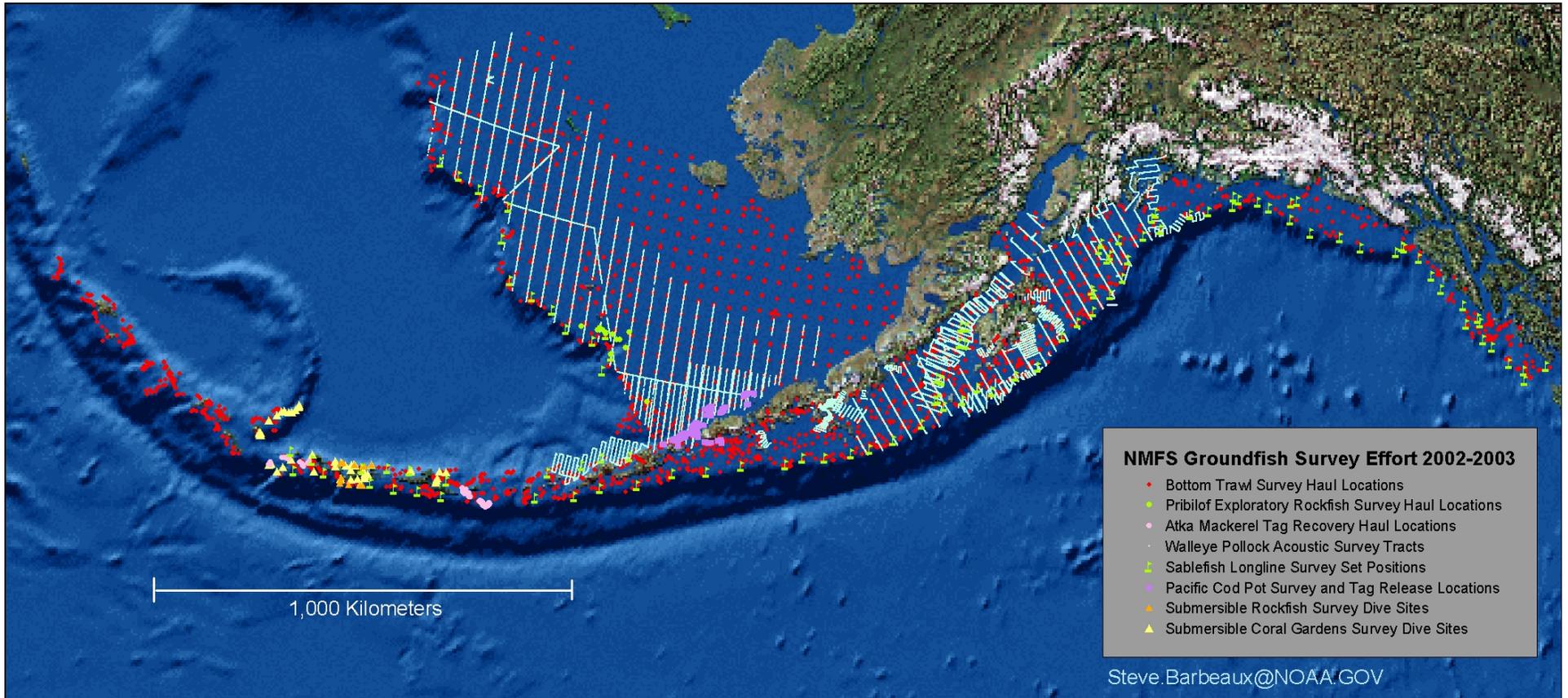
Tier 6 – reliable Catch History Data



# Sabelfish Longline Survey



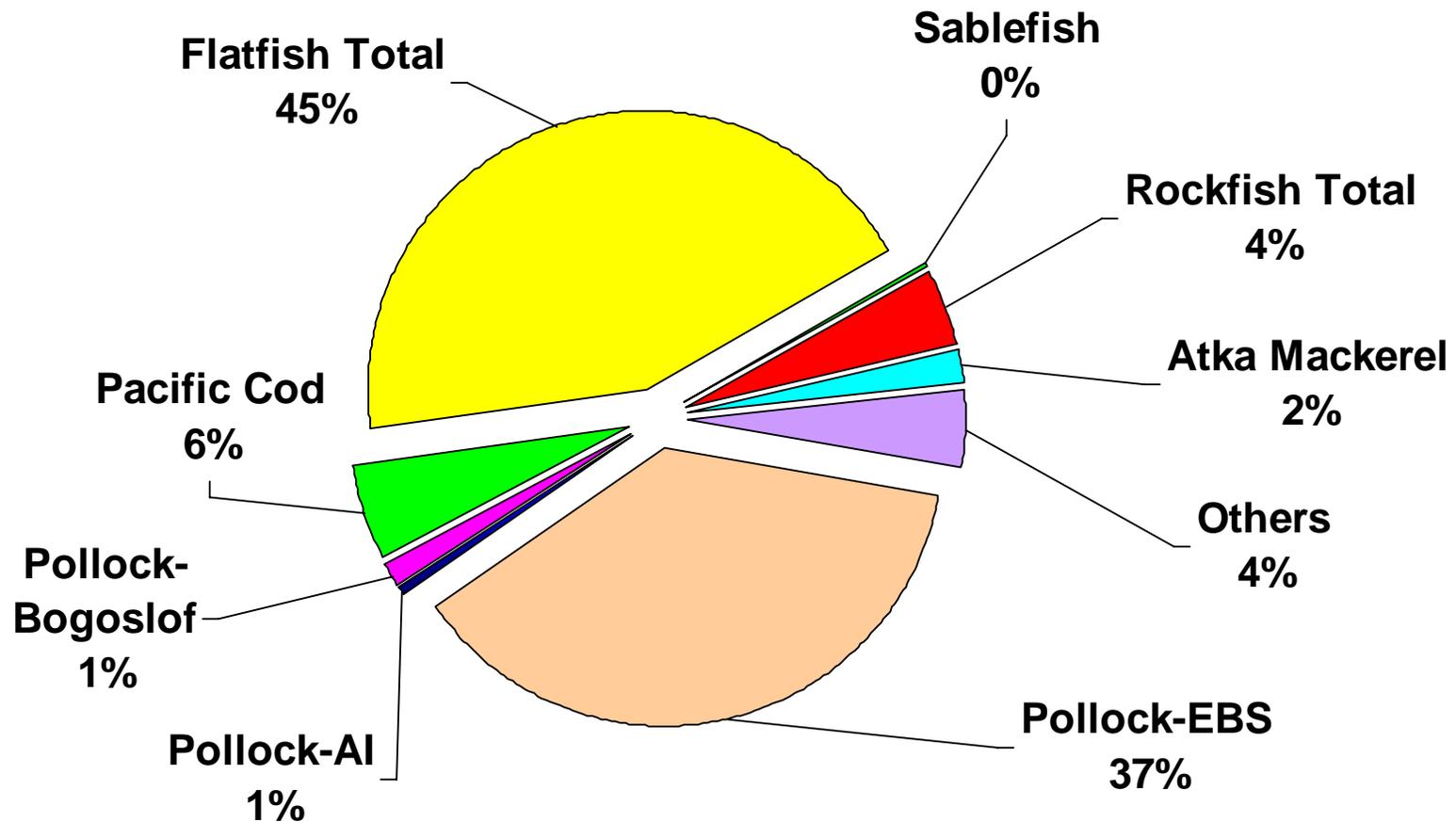
# Series of Surveys by AFSC



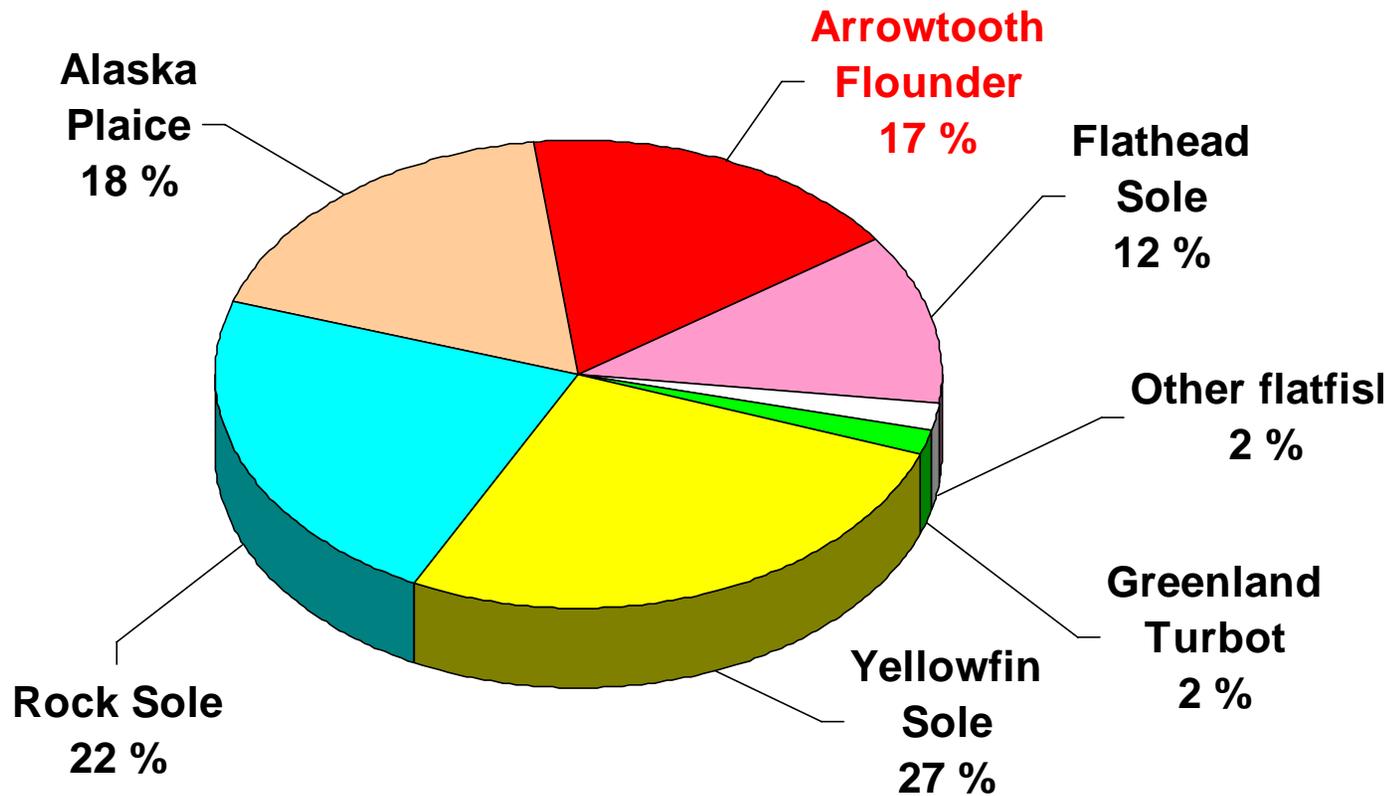
# Overview of Exploitable Biomass

By  
Major Species Groups

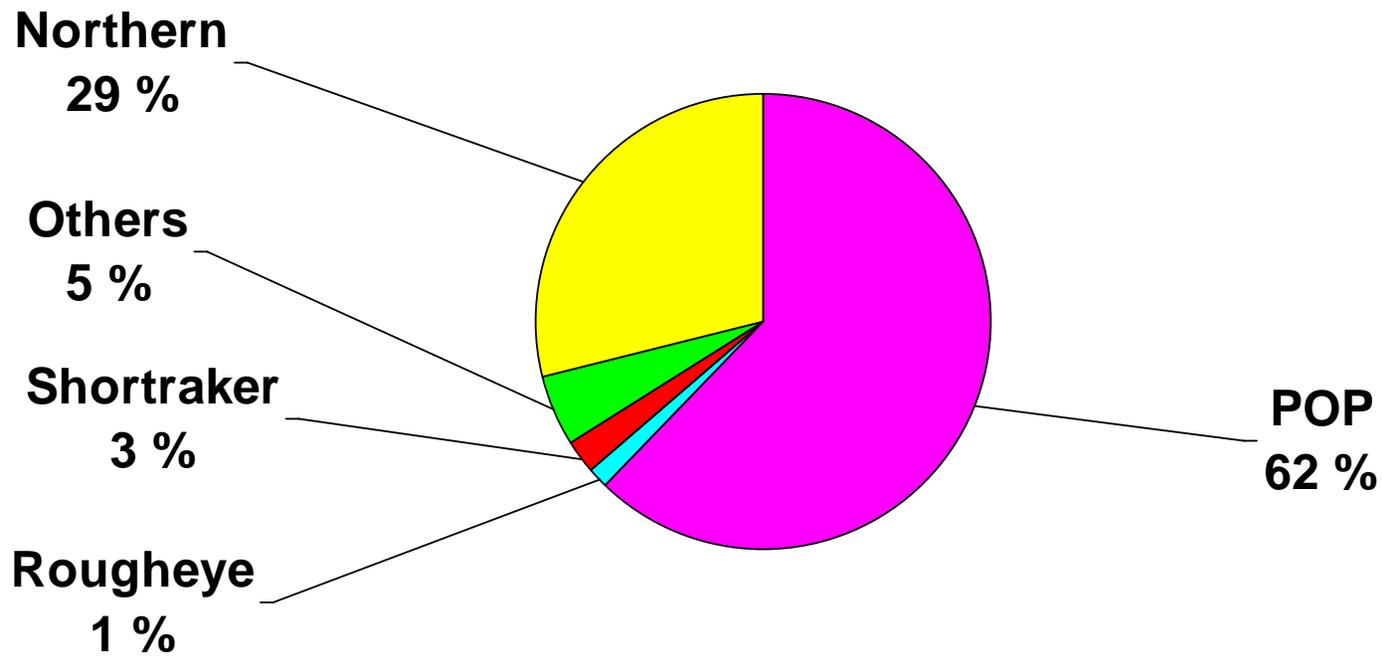
**Nov 2006 Assessment**  
**BSAI Exploitable Biomass**  
**Year 2007 Total = 17 MMT**  
**(down 1.3% from last year)**



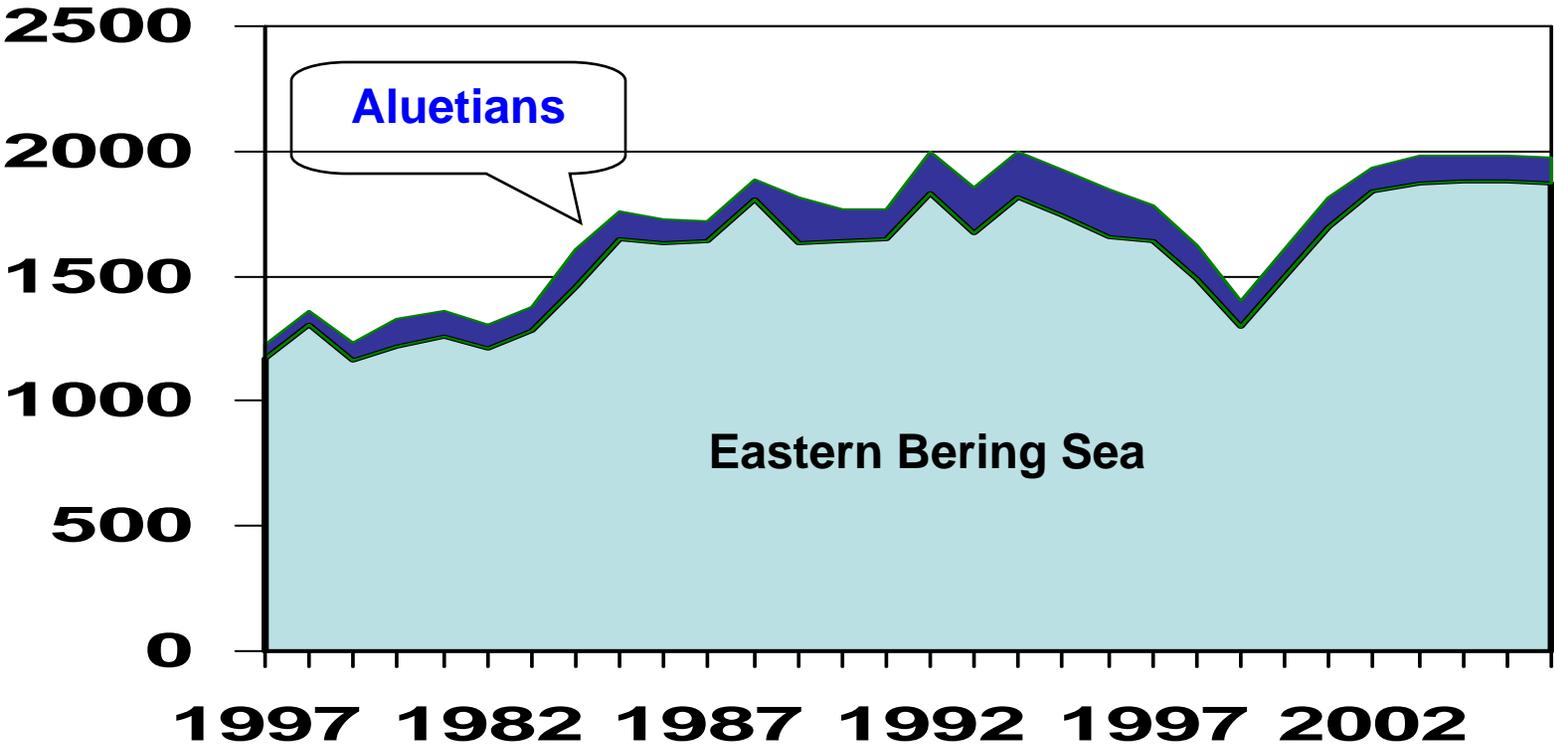
**Nov 2006 Assessment**  
**BSAI Flatfish Complex Biomass**  
**Year 2007 Total = 7.433 MMT**  
**(up 24 % from last year)**



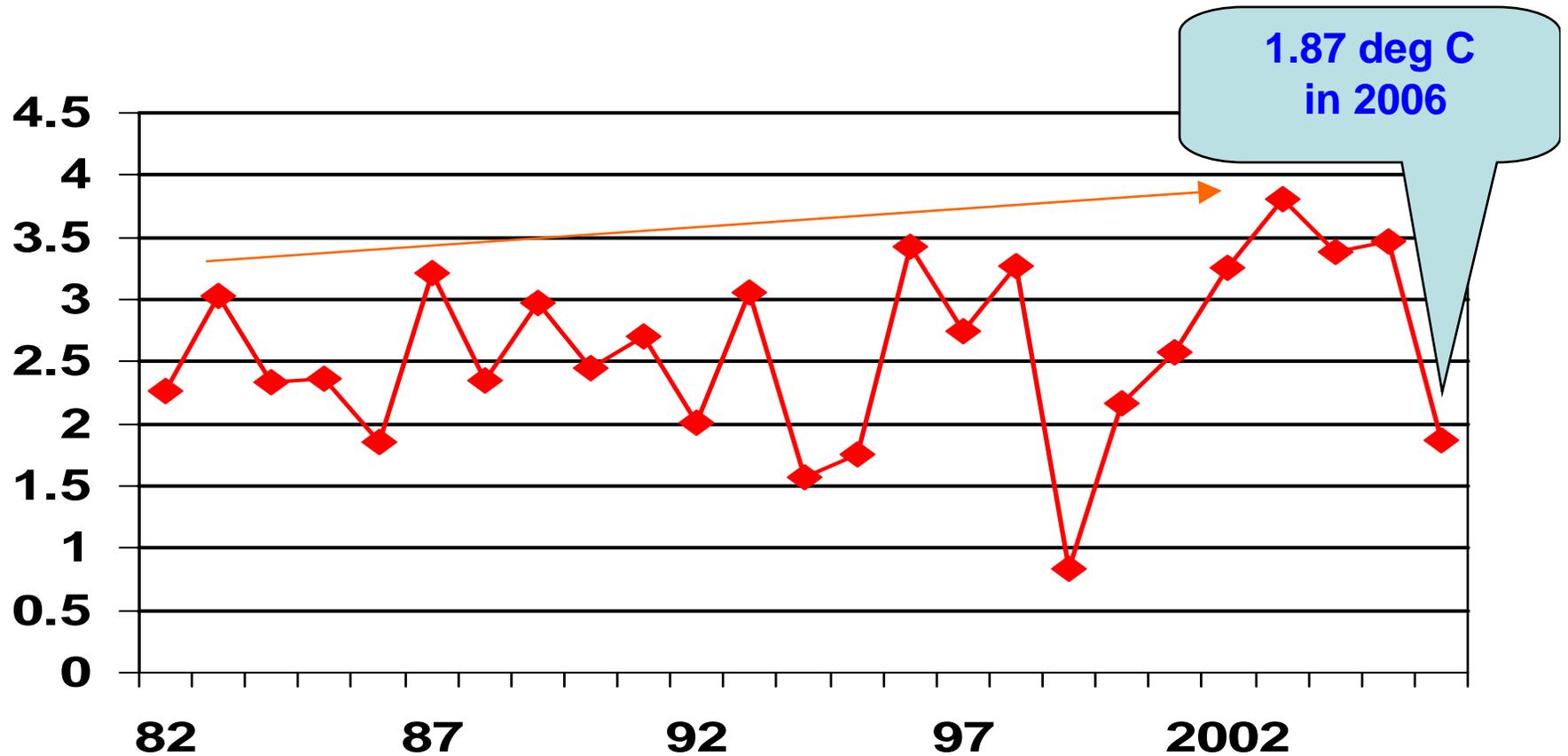
Nov 2006 Assessment  
BSAI Rockfish Complex Biomass  
Yr 2007 Total = 735,400 MT  
(Up 13 % from last year)



# Total Groundfish Catch, 1977-2006 (Thousands of MT)



# Mean Bottom temperature, 1982-2006 Eastern Bering Sea NMFS Trawl Surveys



## SAFE Document Big Picture

- Moving towards analyses by area/species splits
  - Flatfish and Rockfish groups – many analyses are already by species groups – like SR and RE by area
  - Other species category – analyses by species groups like sharks, skates, sharks, sculpins, octopus
  - But “Other Species” category is still being managed as a group.
- Team ABCs mostly at maximum permissible or reduced levels to maintain Female Spawning Biomass
- Rockfish Analyses are on 2-year assessment cycle to coincide with Surveys. 2006 is a survey year.

# Ecosystem Considerations

- All chapters now have EC sections
  - Most have extended discussions about ecosystem impacts on the species and fishery impacts on the ecosystem
  - Substantial data and analyses have been considered
- Some analyses added results from ecosystem models - Pollock, Atka mackerel, skates, squid, octopus, sculpins
- Influence of temperature on surveys
  - Applies to Pollock, cod, all flatfish except turbot and “other”
- Added effects of regime shifts on recruitment
  - Cod, all flatfish except turbot and “other”

## Plan Team's Estimates of Biomass, OFLs and ABCs

- Plan Team numbers are in Table 5 of Appendix A of SAFE report
- The AP and the Council has deferred to the SSC estimates derived at its December Meetings
- General Trends – Overall groundfish biomass and ABCs are trending down
  - Down, 13 Species/Groups
  - Up, 6 Species/Groups (5 Flatfish Species & POP)
  - Unchanged, 1 Group (Squid)

# Summary (Pollock)

(From Table 5, Team Summary Appendix A)

Stock	Biomass (mt)	ABC (mt)	ABC Change from 2006
Pollock, EBS	6,361,000	1,300,000	Down 33%
Pollock, AI	95,000	16,800	Down 43 %
Pollock, Bogoslof	240,000	5,220(SSC)	Down 5 %

# Summary (Cod and Sablefish)

(From Table 5, Team Summary Appendix A)

Stock	Biomass (mt)	ABC (mt)	ABC Change From 2006
Pacific Cod, BSAI	960,000	176,000	Down 9%
Sablefish, EBS	33,200	3,530	Down 3 %
Sablefish, AI	31,300	2,810	Down 9 %

# Summary (Flatfishes)

(From Table 5, Team Summary Appendix A)

Stock	Biomass (mt)	ABC (mt)	ABC Change from 2006
YellFn. Sole	2,000,000	136,000	Up 12 %
Grn. Turbot	119,000	2,440	Down 11%
Arrow. Fl	1,280,000	158,000	Up 16 %
N.RockSole	1,670,000	121,000	Down 4 %
Flathead S	875,000	79,200	Up 32 %
Alaska Plaice	1,340,000	190,000	Up 1 %
Other Flats	149,000	21,400	Up 18 %

# Summary (Rockfishes)

(From Table 5, Team Summary Appendix A)

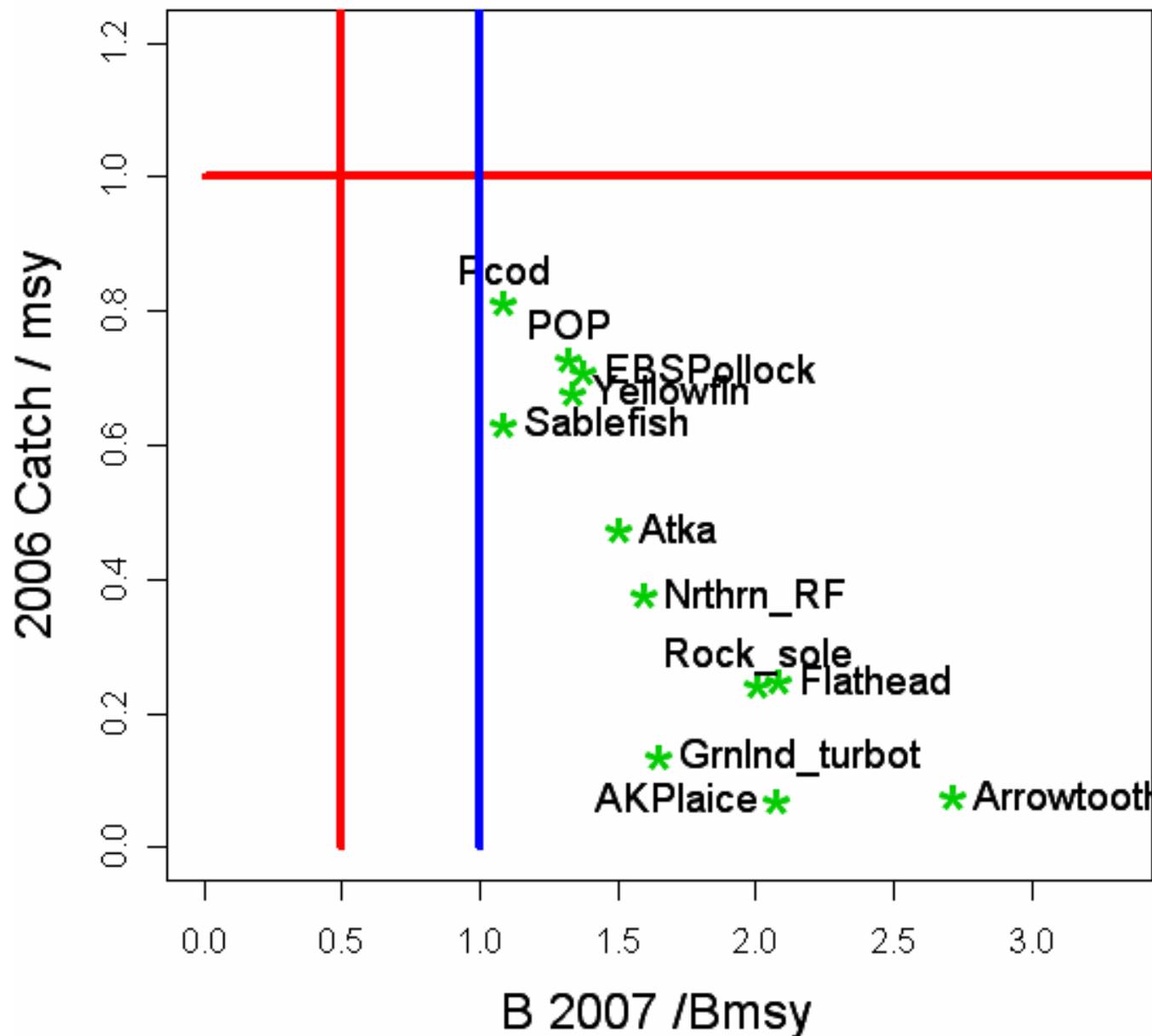
Stock	Biomass (mt)	ABC (mt)	ABC Change From 2006
POP, BSAI	457,000	21,900	Up 48 %
Northern R	212,000	8,190	Down 4 %
ShortRaker	18,900	424	Down 27 %
Rougheyeye	10,800	202	Down 10 %
Other Rockfish	36,700	999	Down 29 %

# Summary (Atka Mackerel & Other Species)

(From Table 5, Team Summary Appendix A)

Stock	Biomass (mt)	ABC (mt)	ABC Change From 2006
Atka Mackerel	364,000	74,000	Down 33 %
Squid	NA	1,970	Same
Other Species	734,000	71,900	Up 22 %

## Bering Sea and Aleutian Islands Region



# Description

## Species-by-Species

Start with Pollock Stocks

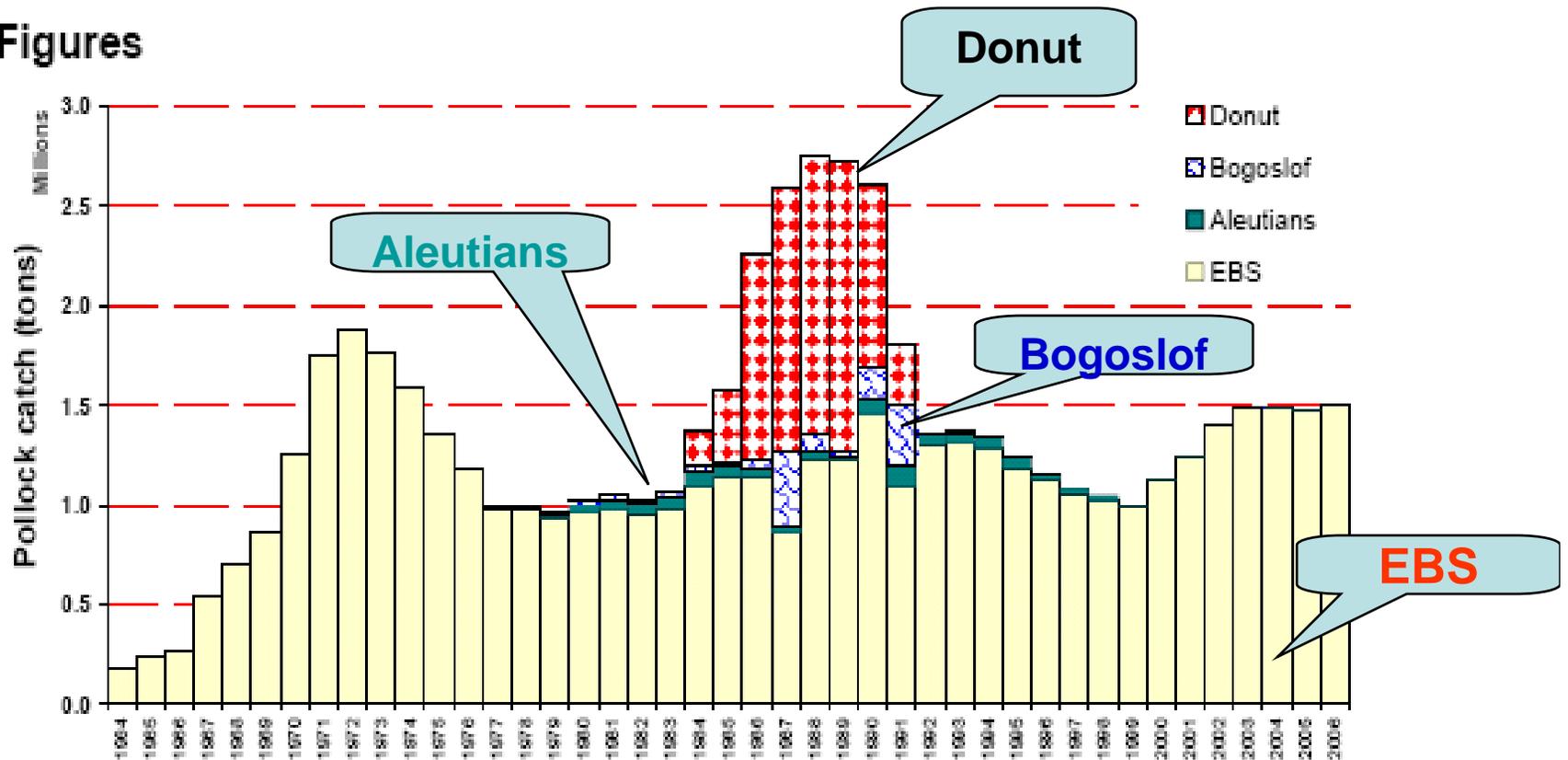
- EBS
- Aleutian Islands
- Bogoslof Region

# **Pollock Assessments**

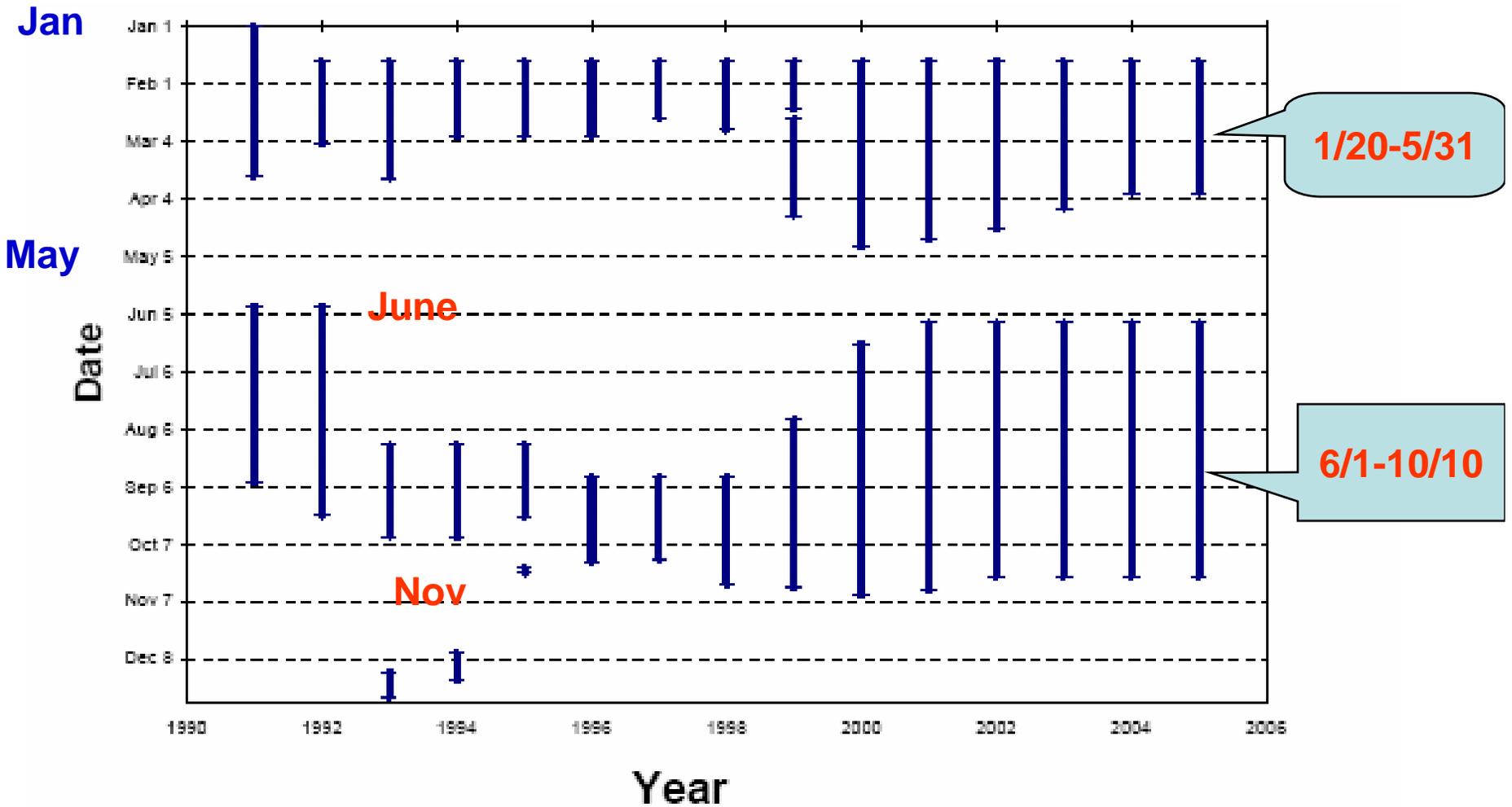
**Chapters 1, 1a, and 1b**

# Pollock Catch, BSAI Areas, 1964-2005/6

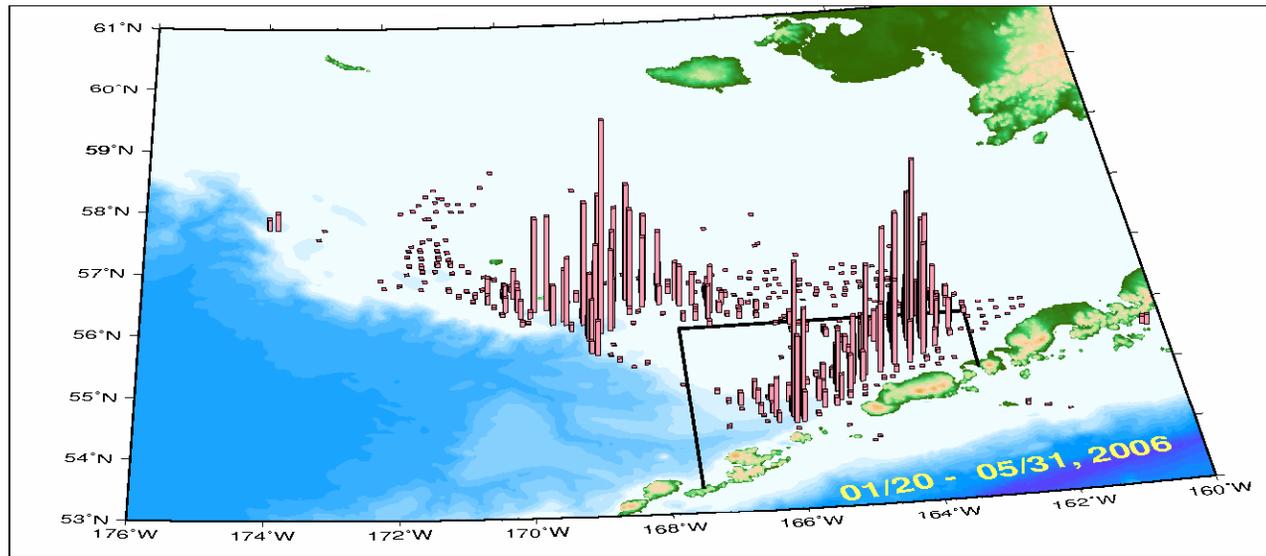
## Figures



# A & B Fishing Seasons, 1991-2005

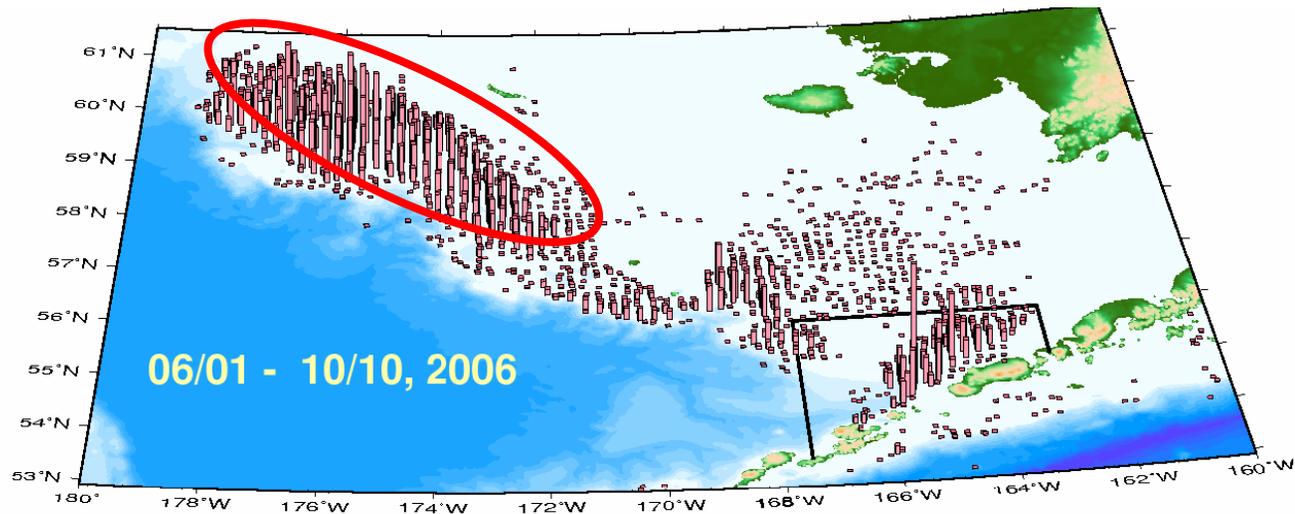


# Catch Patterns, A and B seasons 2006



**A-Season**

**1/20-5/31**



**B-Season**

**6/01-10/10**

## **EBS Pollock Surveys - Notable Features (#1)**

### **1. Year 2006 Surveys**

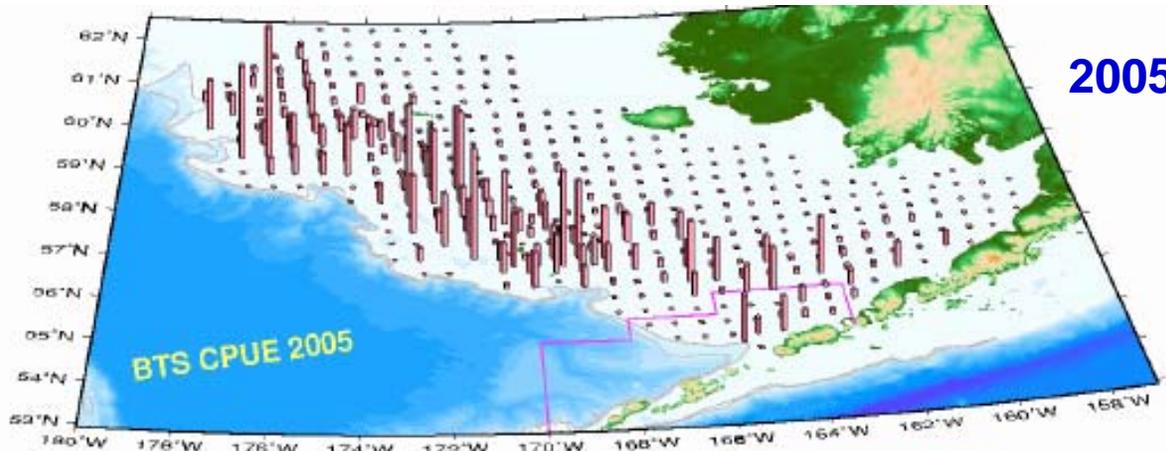
**Bottom Trawl Biomass = 2.85 mmt, down 45% from 2005 survey.**

**EIT survey Biomass = 1.56 mmt, down 53% from 2004 survey**

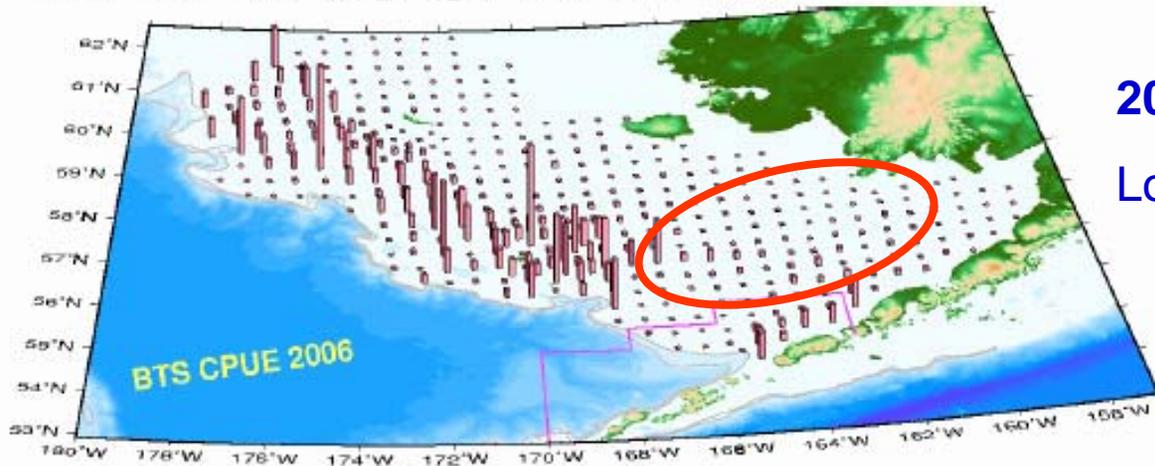
### **2. Why such drastic declines?**

**- Ocean Temperatures and associated conditions -**

# Bottom Trawl Surveys, 2005 vs 2006



2005

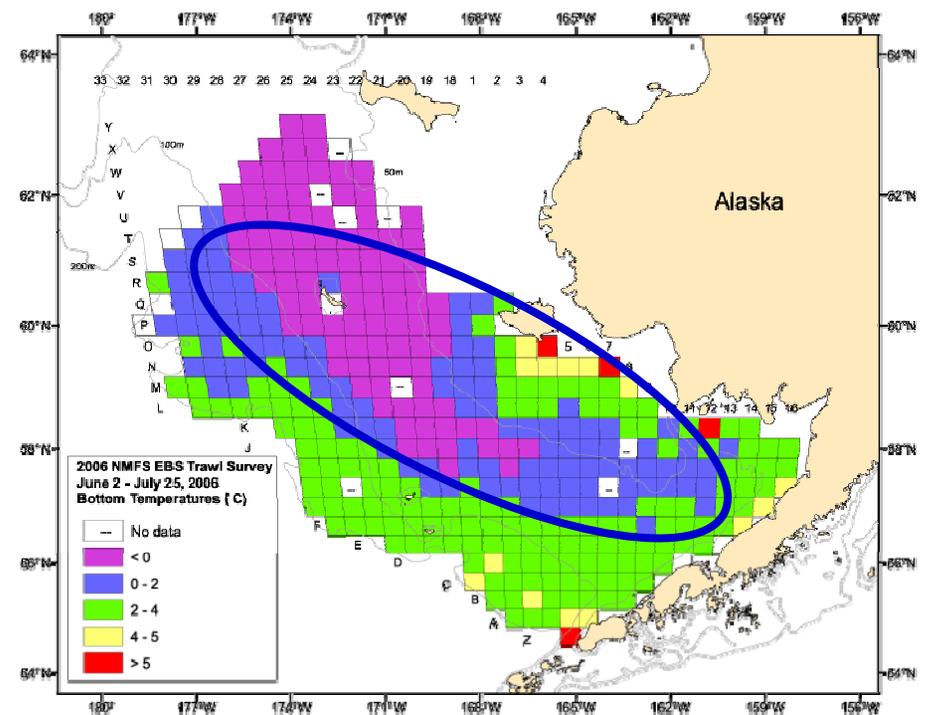
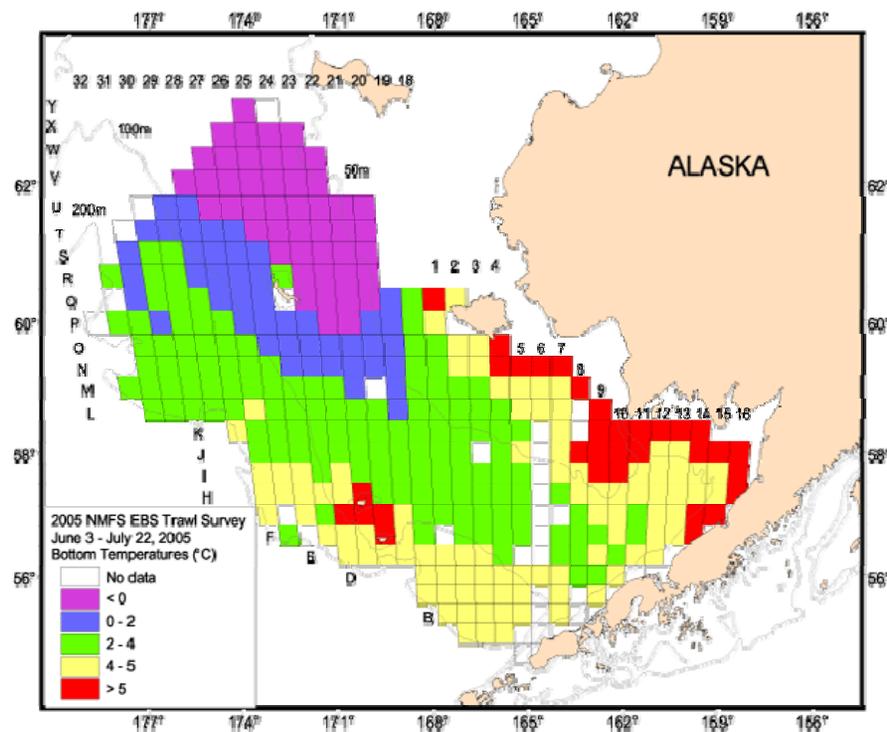


2006

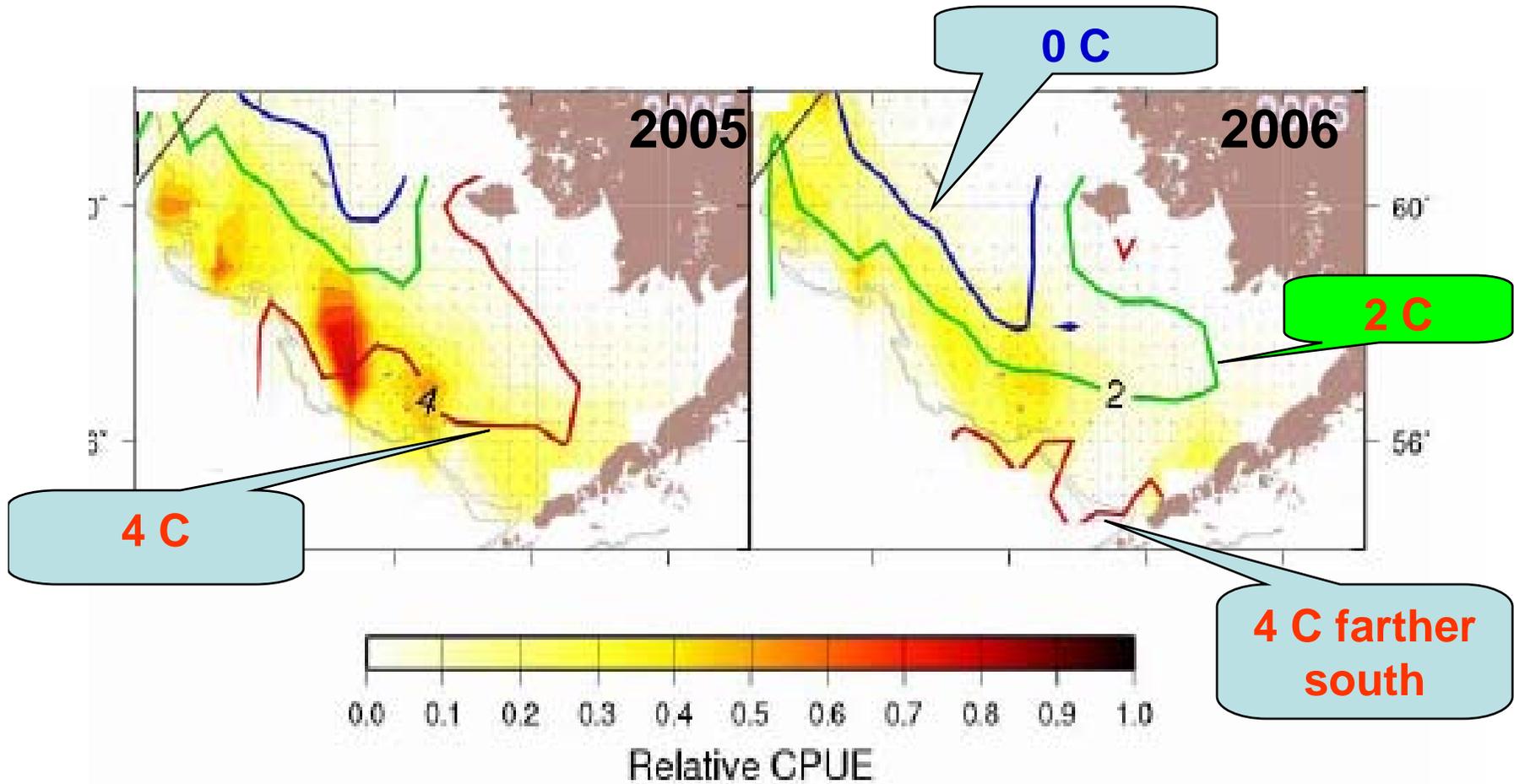
Low Catches on Shelf

# EBS Survey Bottom Temperature: 2005-2006

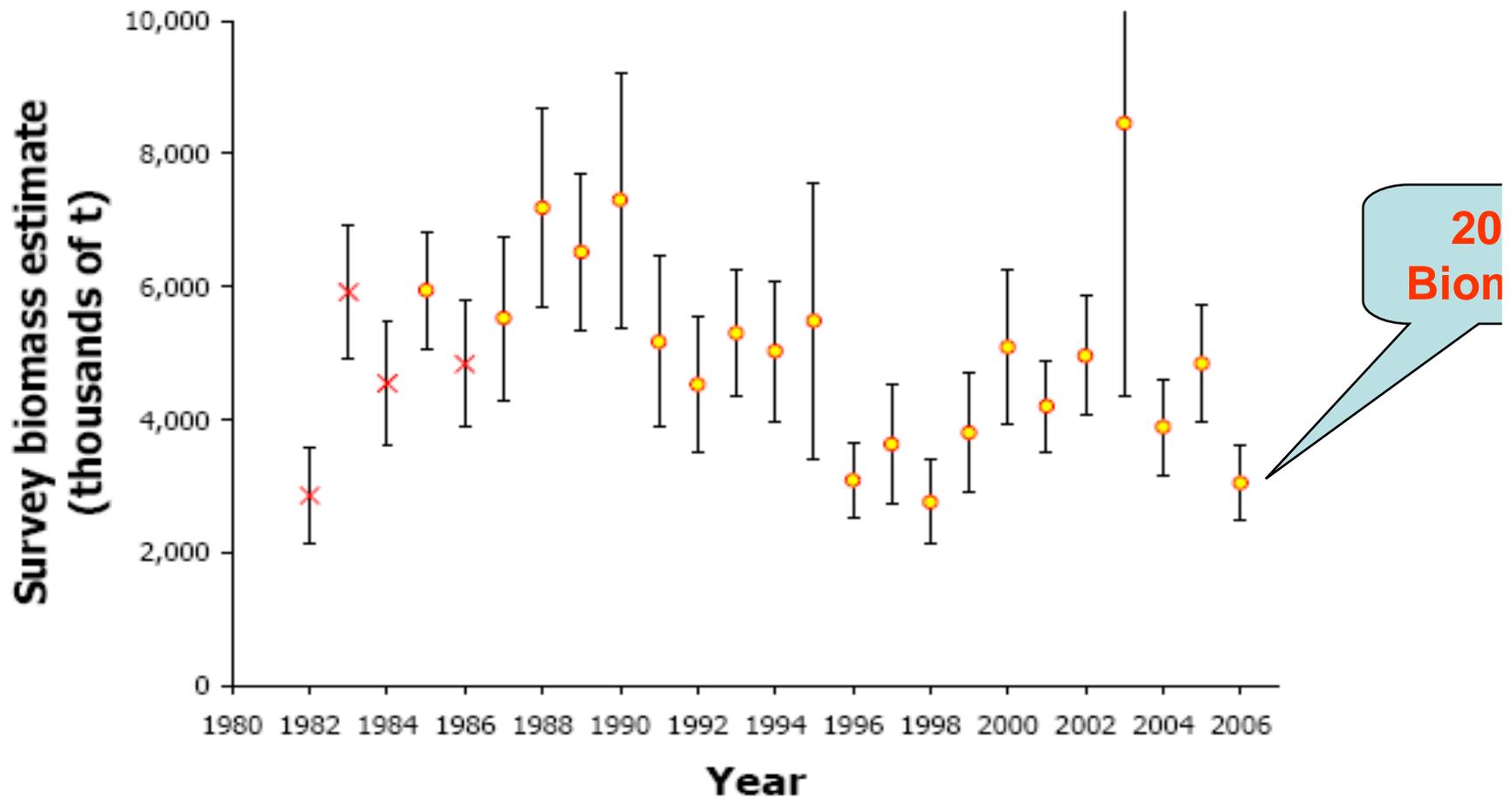
(Intrusion of cold water into EBS shelf)



# Lower Survey CPUE in 2006 in relation with 0, 2, 4 degrees C isotherm



# Bottom Trawl Survey Biomass, 1982-2006



## **EBS Pollock Assessment - Features (# 2 & 3)**

### **2. Year 2006 Modeling**

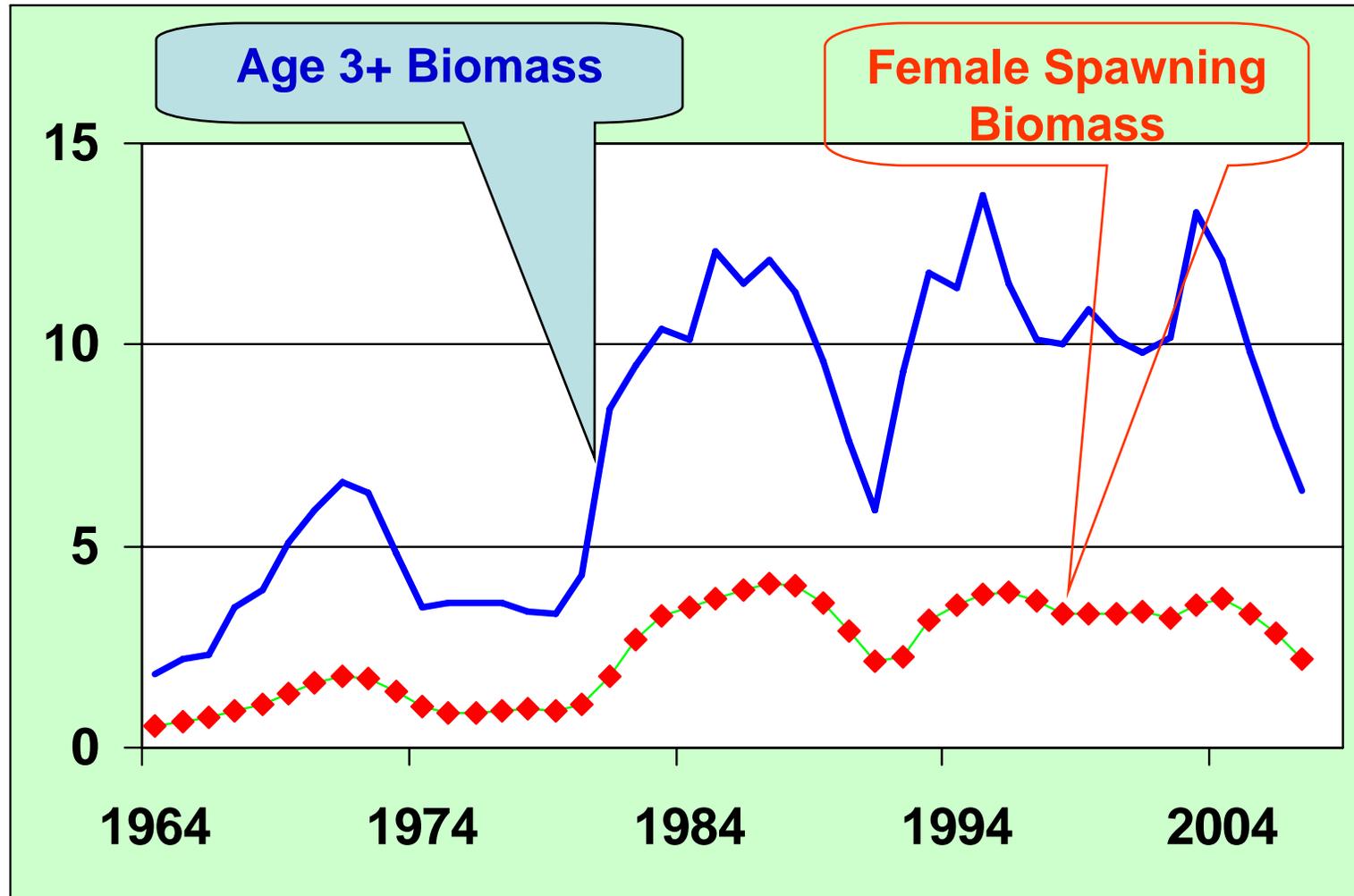
**Reference Model 2 selected among 3 presented  
Age3+ Biomass for 2006 = 6.4 mmt,  
Down 20% from 2005  
2007 stock projected to be near Bmsy**

### **3. Recruitment**

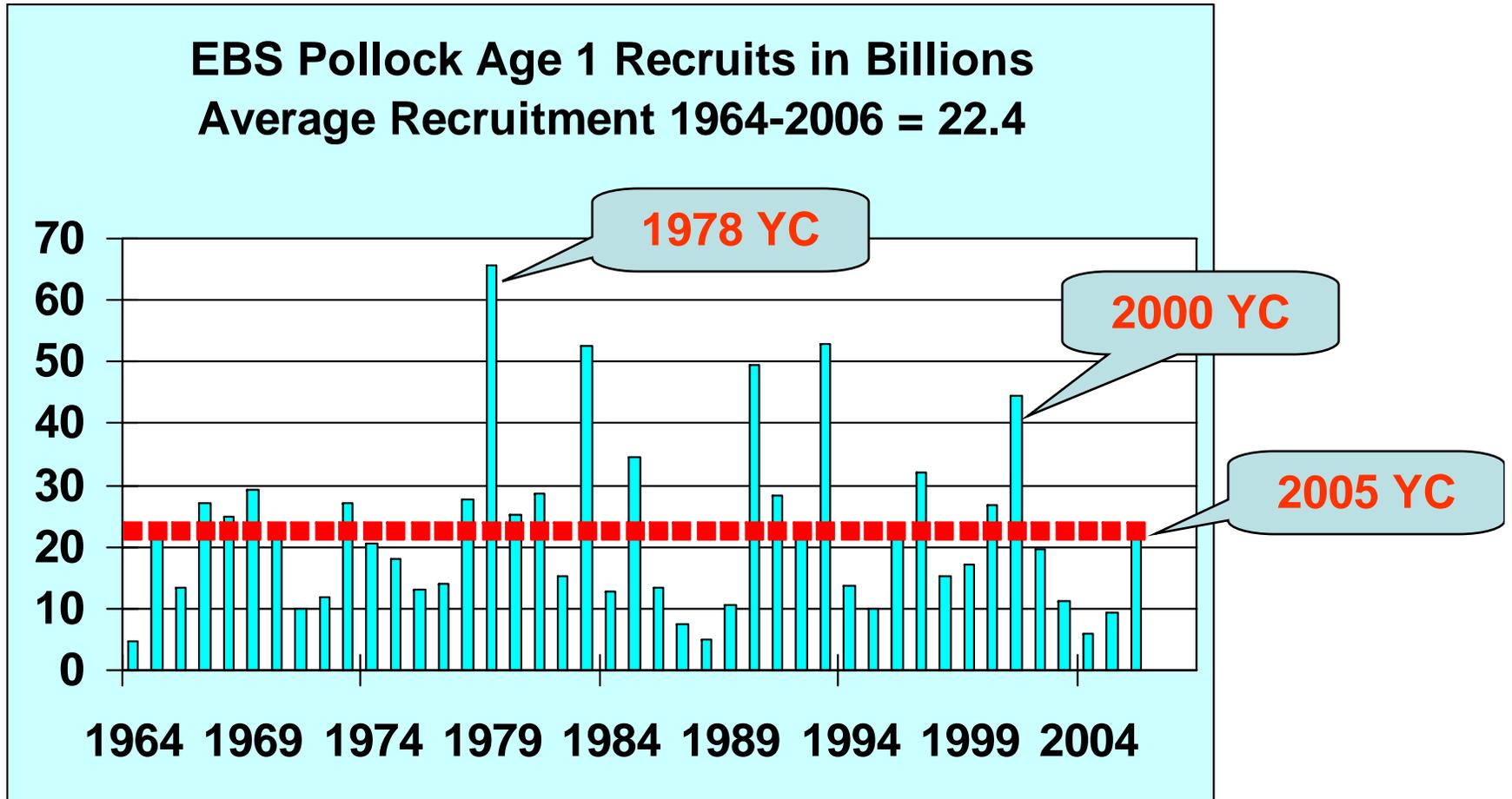
**2000 Year Class is Above Average and would  
make up about 20% of the exploitable biomass in  
2007.**

**All year classes from 2001 are below average.  
Possible above average 2005 YC**

# Model Biomass, 1964-2007 (mmt)



# Recruitment, 1964-2006



## **EBS Pollock Assessment - Notable Features (# 4)**

### **4. ABC Determination**

**Tier 1 Max ABC = 1.512; Tier 3 ABC = 1.394 mmt**

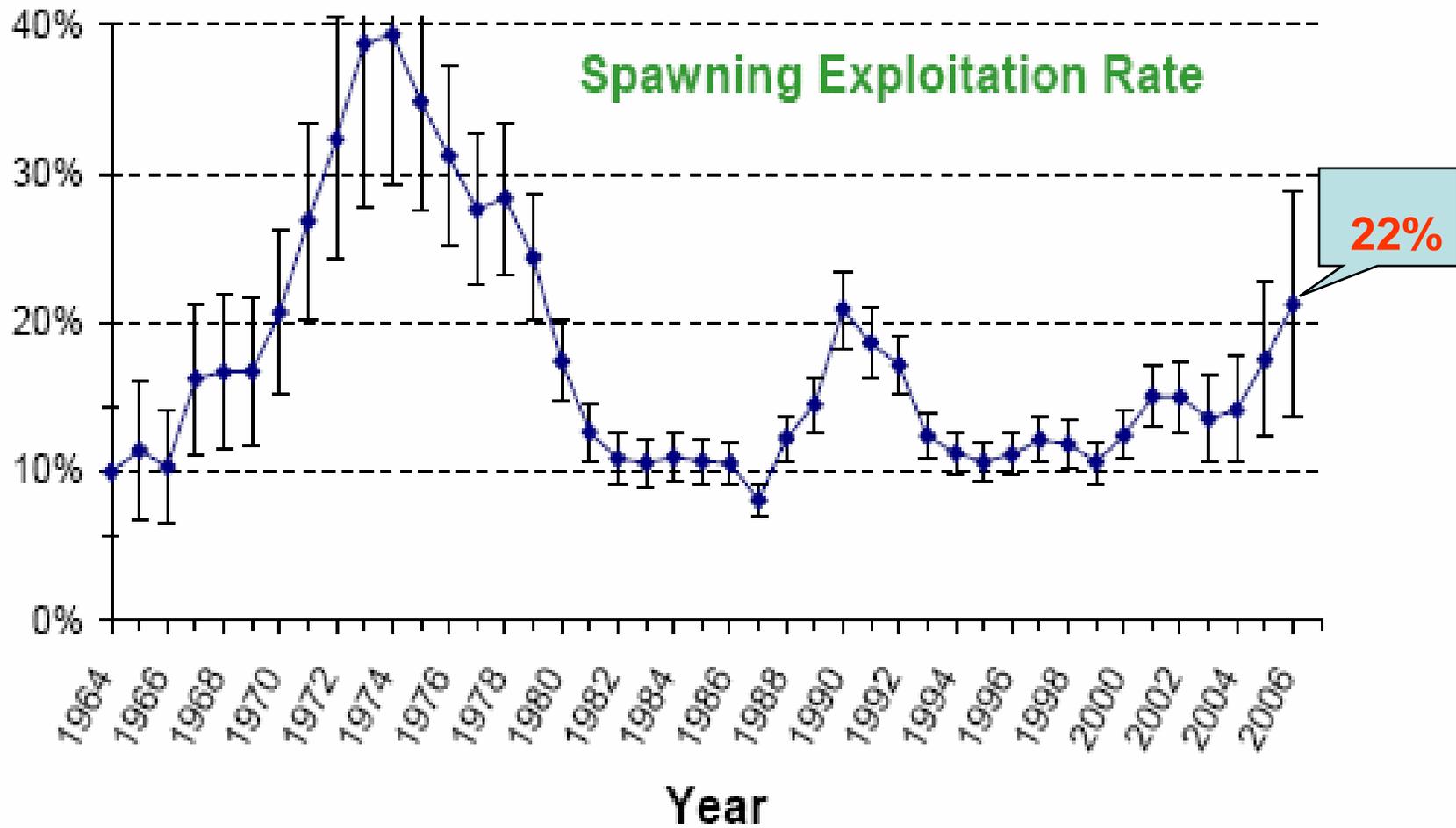
**Author wanted to set ABC to maintain female spawning biomass**

**Desire not to exceed 22% exploitation rate**

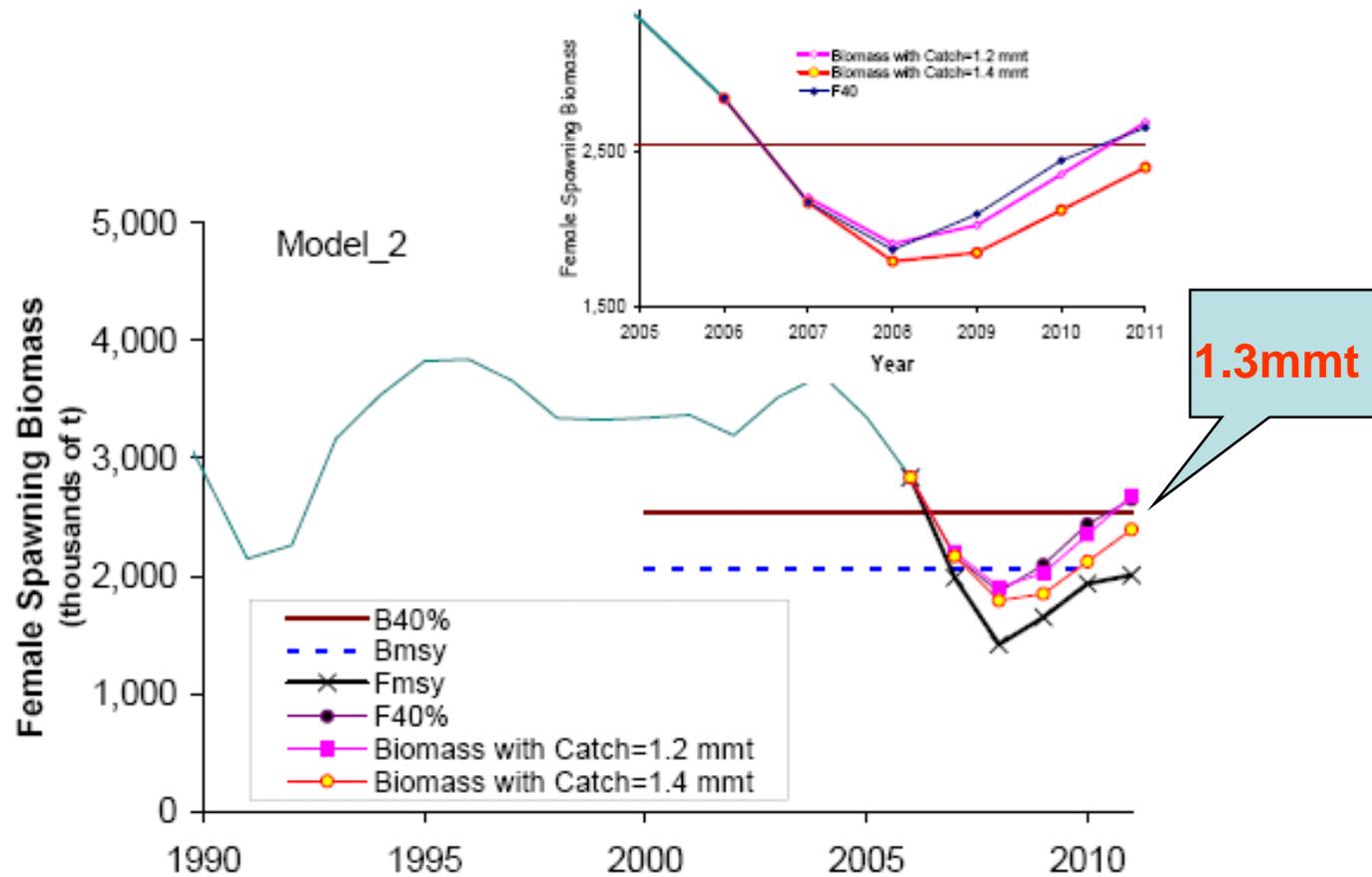
**Author Simulated catches that range from 1.2 – 1.4 mmt**

**Team and author recommend 1.3 mmt ABC for 2007 to keep female exploitation rate close to 22%**

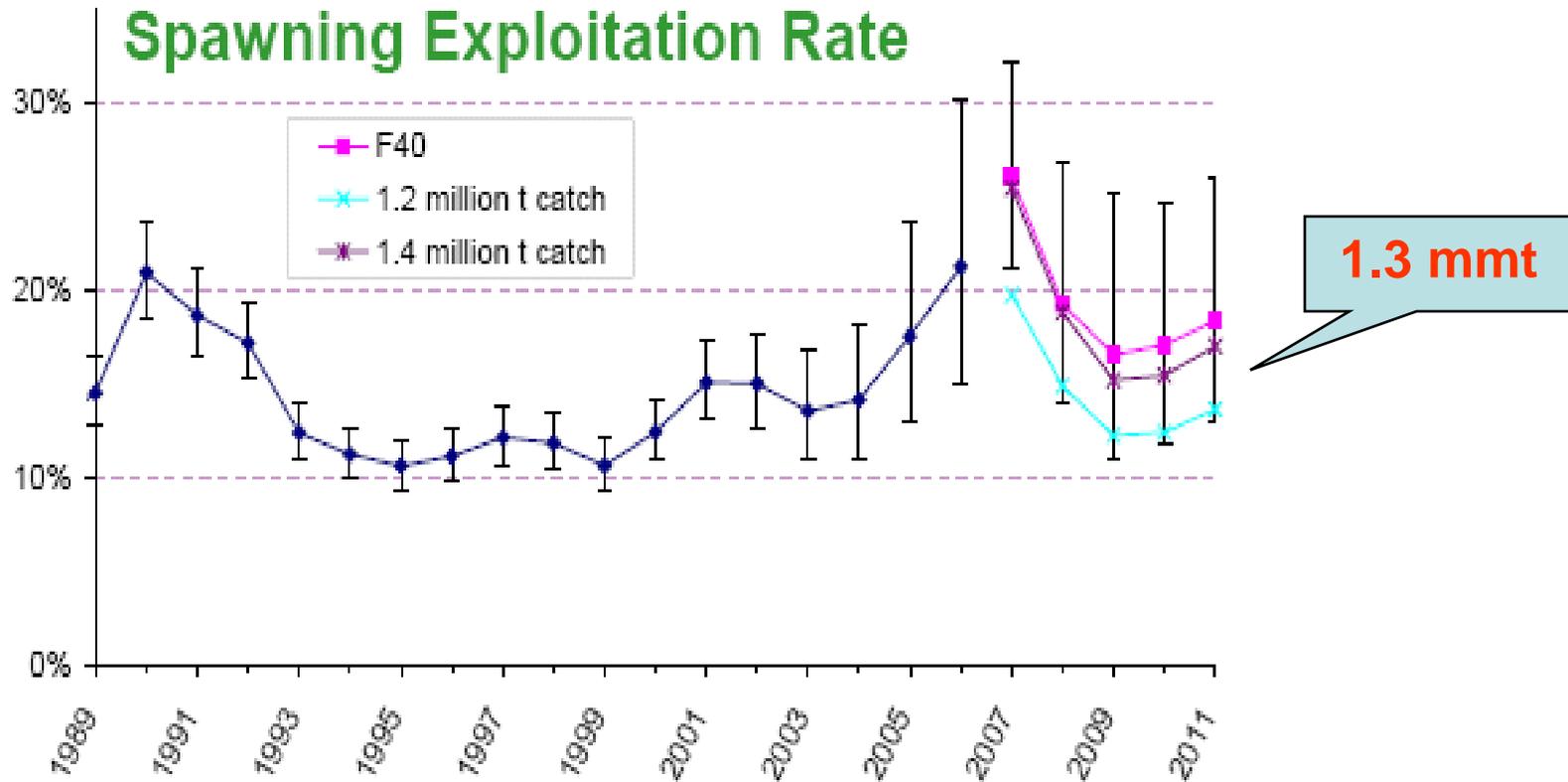
# Historical Spawning Exploitation Rates, 1964-2005



# Projections of FSB to 2011



# Recent FSB Exploitation Rates



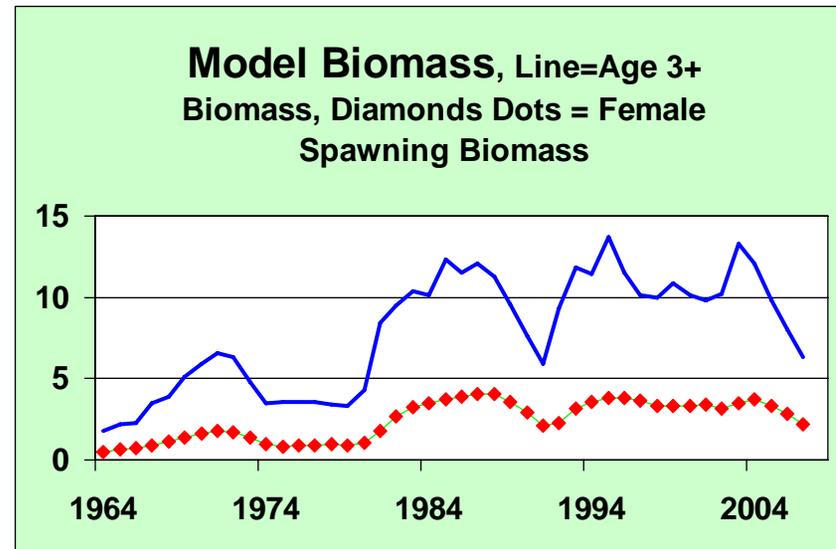
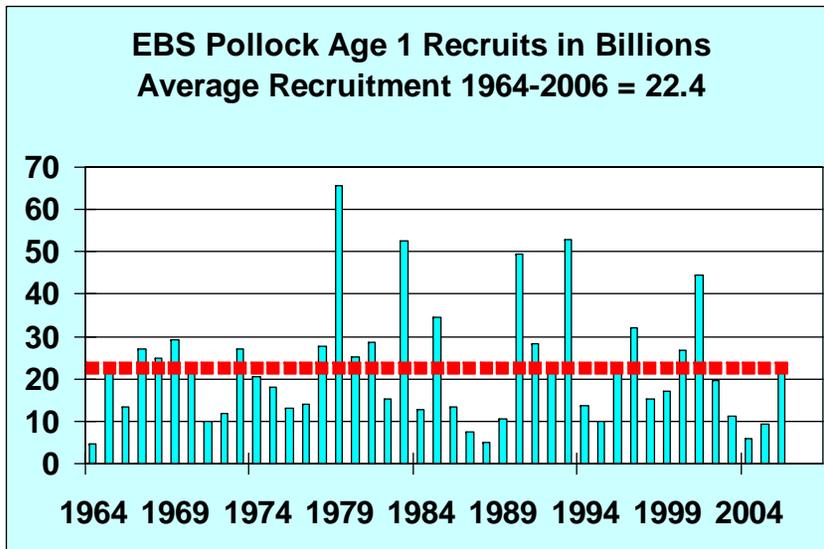
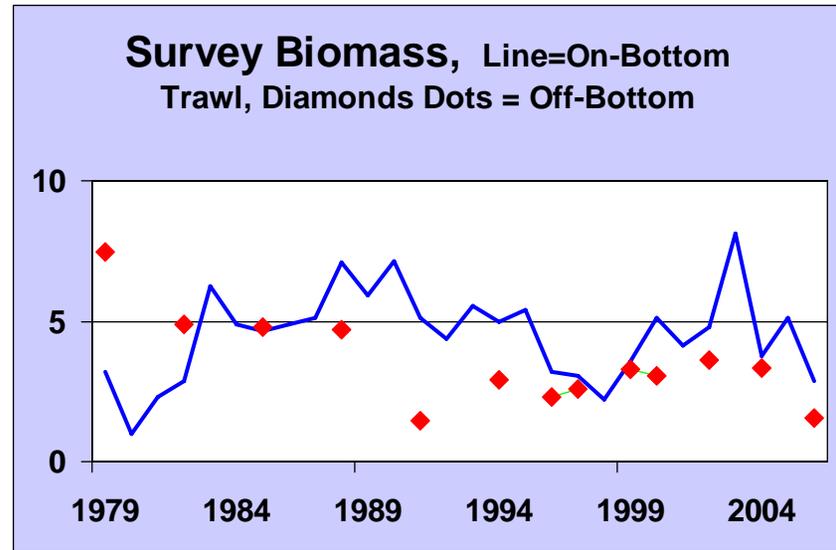
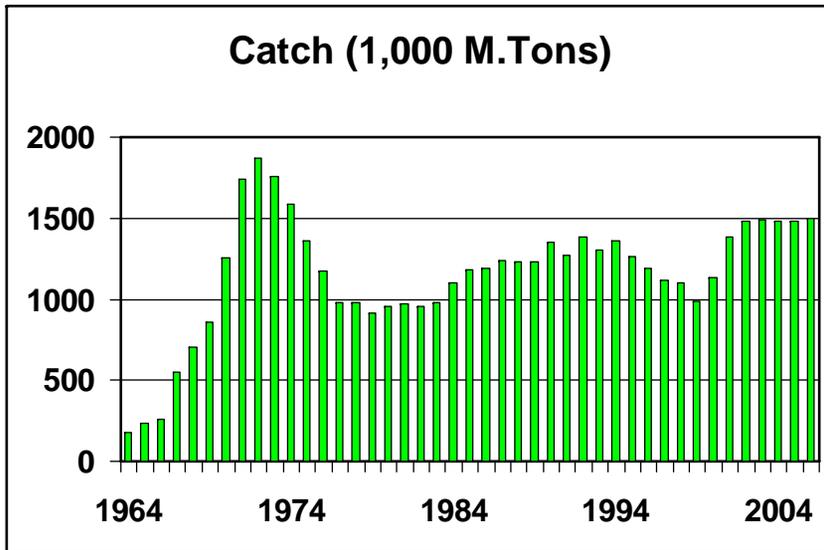
## EBS Pollock Assessment - Notable Features (#5)

### 5. Projections

	Tier 1 ABC Mmt	Tier 3 ABC mmt	SSC (Plan Team)
<b>2007</b>	<b>1.512</b>	<b>1.394</b>	<b>1.394</b> <b>(1.300)</b>
<b>2008</b>	<b>1.257*</b>	<b>0.913</b>	<b>1.318</b> <b>(1.300)</b>

\* Assumes catch in 2007 = ABC

# EBS Pollock Stock Assessment, Dec 2006



# Aleutian Islands Region Pollock Assessment

## 1. History of Fishing

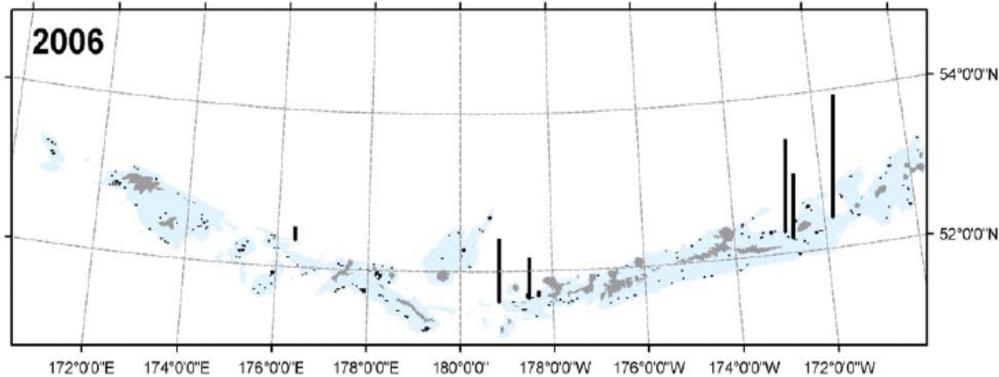
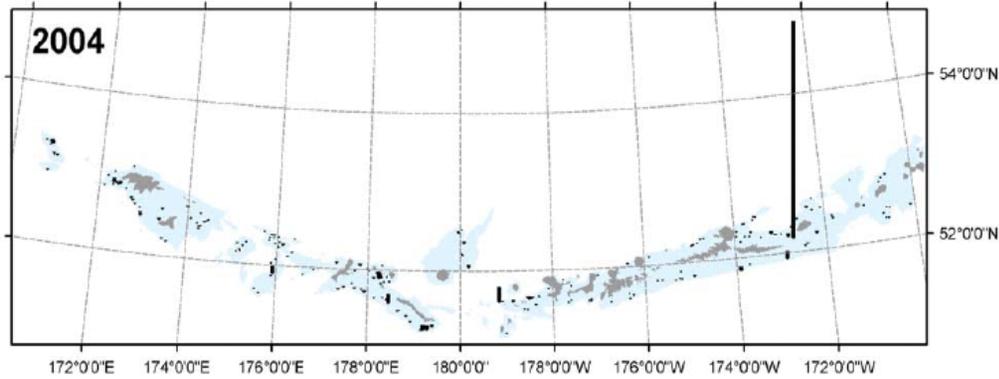
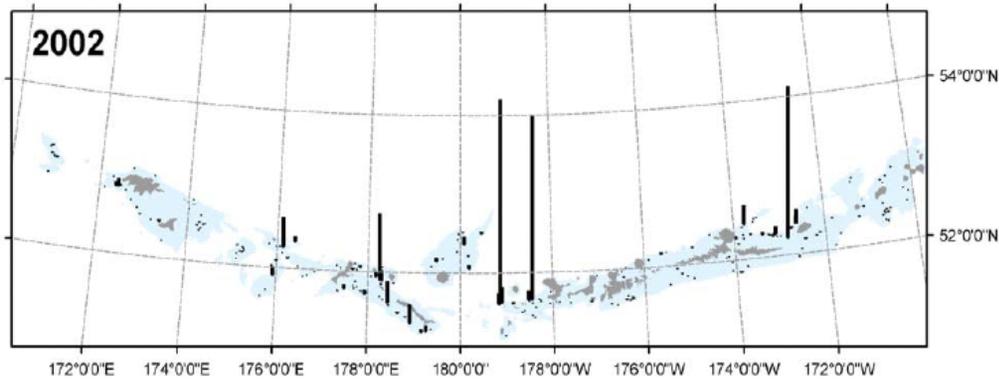
1. 1970s-1980 --- Foreign fisheries
2. 1989-1998 --- Domestic fisheries
3. 1999-2004 – No directed fishing, Bycatch only
4. 2005 on.....19,000 mt TAC allocation to Aleut Corporation

## 2. Age Structured Model developed in 2003 and further improved for Management Strategy Evaluations –

1. Data divided by NRA (Near, Rat, Andreanof Islands) areas
2. M is being estimated internally.
3. But need additional information on stock structure and spatial distributions. More research is needed.
4. Although models provide useful information on Tier 3 estimates of biomass, fishing, and ABC parameters, the Plan Team recommends using Tier 5 to manage the stock.

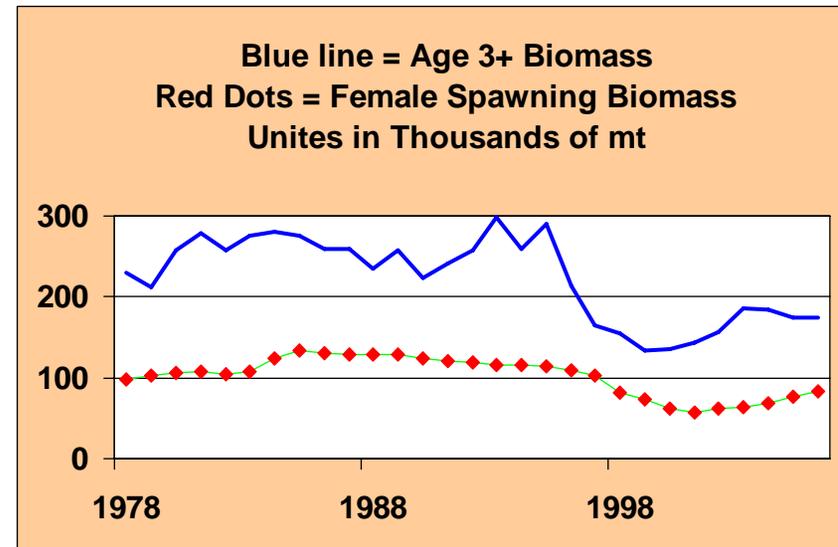
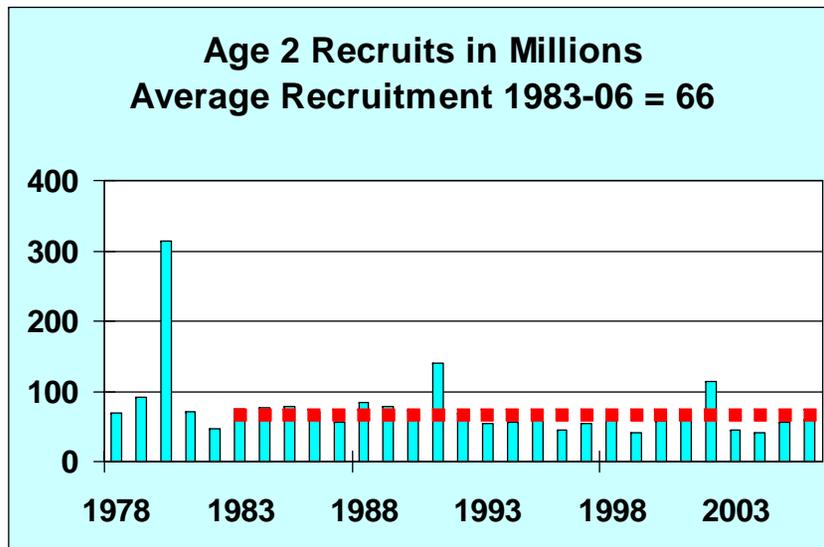
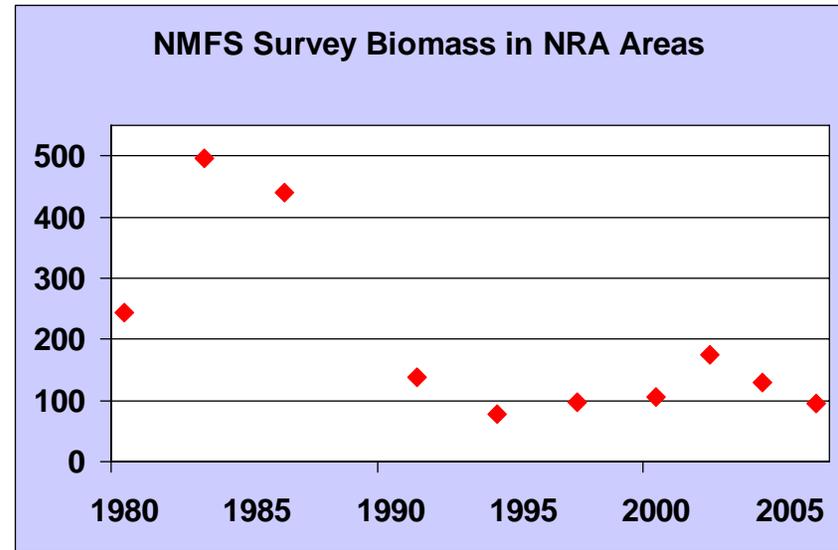
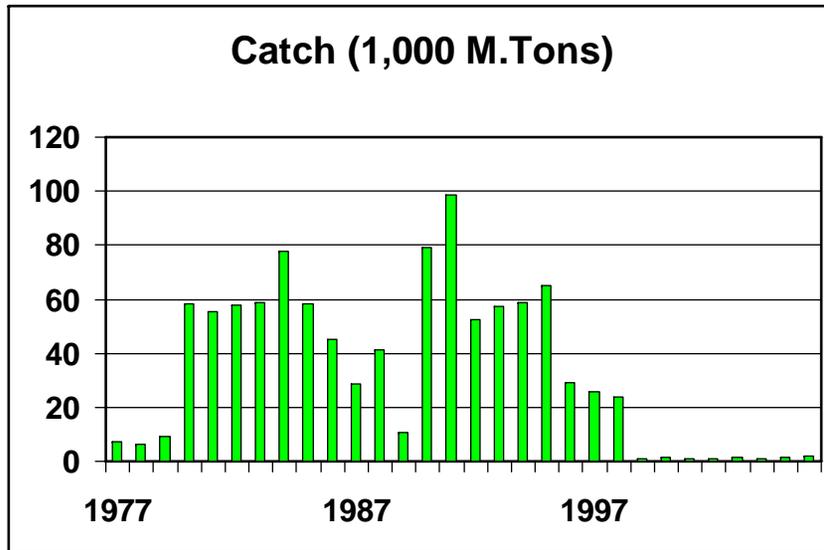
## 3. Tier 5 calculations depend on Reliable estimate of Biomass and M. New survey in 2006 by R/V Miller Freeman show Biomass = 95,000mt, down 17% from 2004

# Pollock Trawl Survey Biomass (mt) Aleutian Islands NRA Region



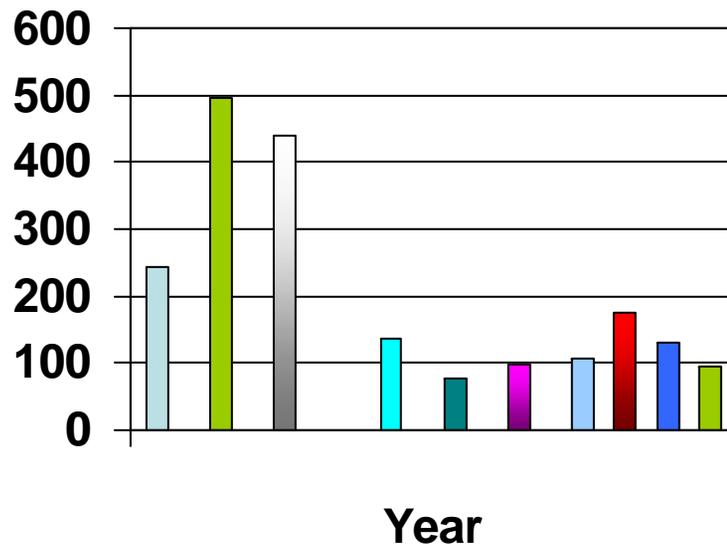
<b>2002</b>	<b>175,000</b>
<b>2004</b>	<b>130,000</b>
<b>2006</b>	<b>95,000</b>

# Aleutian Islands Pollock Assessment, Dec 2006



# Aleutian Island Region Pollock Assessment

## Survey Biomass (NRA Area)



## 1. Survey Biomass (NRA Area)

- 1991 137,000
- 1994 77,500
- 1997 97,500
- 2000 105,600
- 2002 175,000
- 2004 130,000
- 2006 95,000

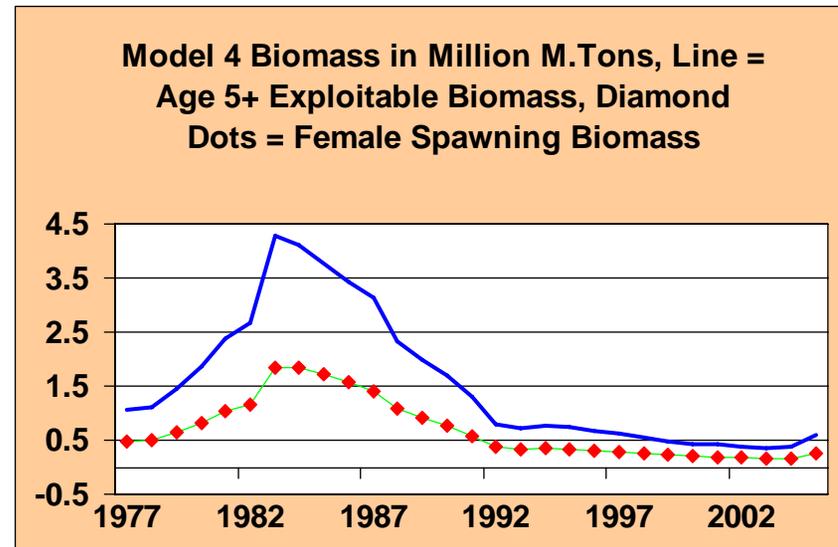
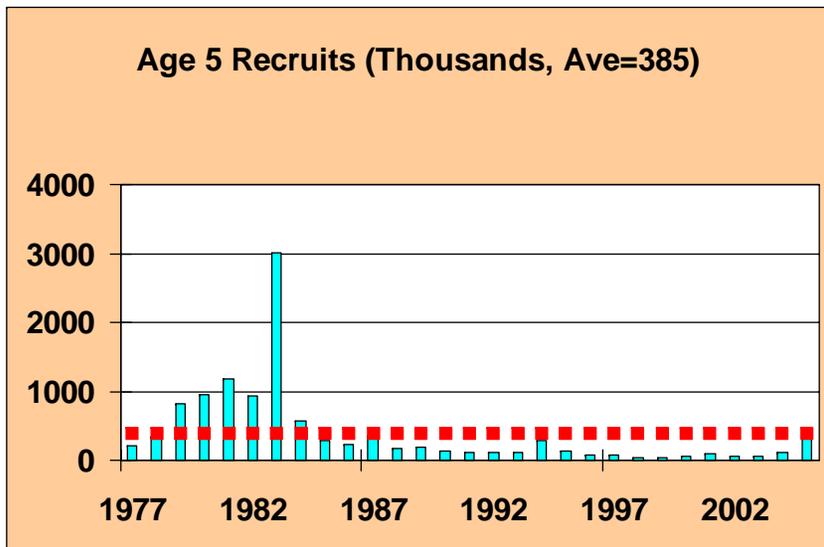
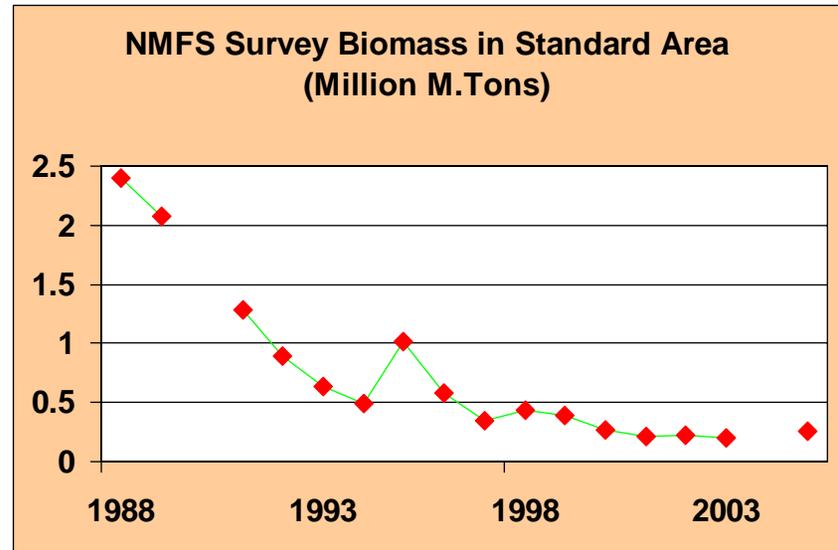
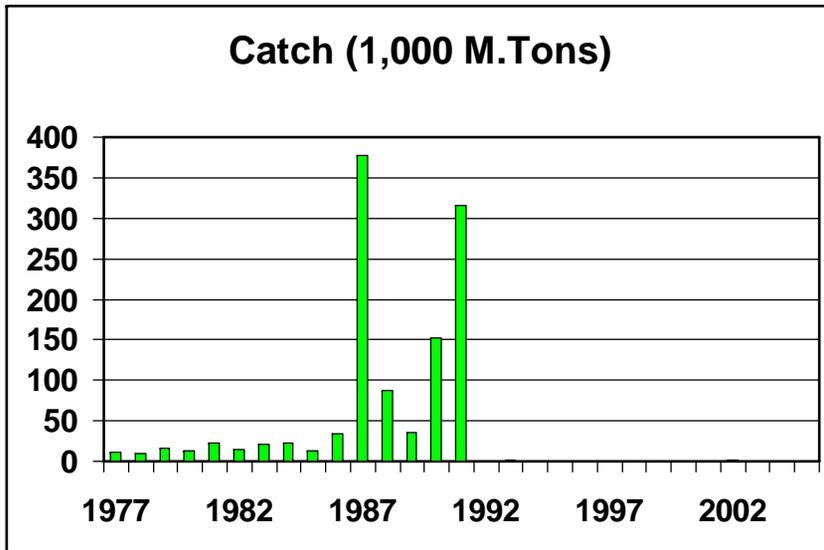
## 2. Has age structured Model, but not quite ready for use

3. ABC from Tier 5 = 16,800 mt

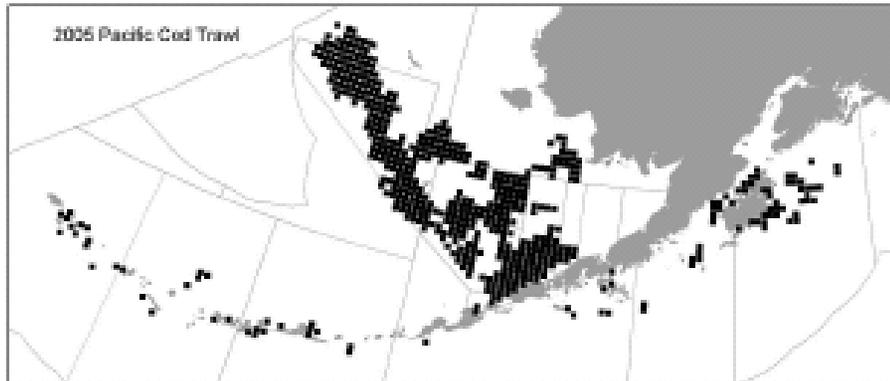
# Bogoslof Pollock Stock

- 1. New survey in 2006 by R/V *Miller Freeman***
  - Biomass = 240,000mt, down 5 % from 2005
- 2. Age Structured Model developed since 2003 for Management Strategy Evaluations**
  - -The model shows that the 1978 Yr Class was very high that built up the stock biomass to peak in 1983.
  - At normal year class conditions, biomass would be much lower; thus there are uncertainties about what recruitment levels to use.
  - Model still could not incorporate stock inter-relationships and there is doubt that the Bogoslof stock can be modeled as a closed population.
- 3. Thus model is not quite Ready for Use and we used Tier 5 to calculate ABC**

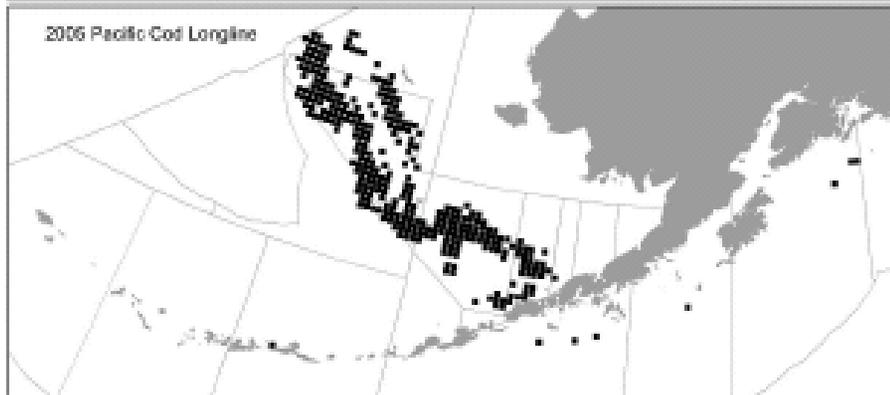
# Bogoslof Island Pollock Assessment, Dec 2005



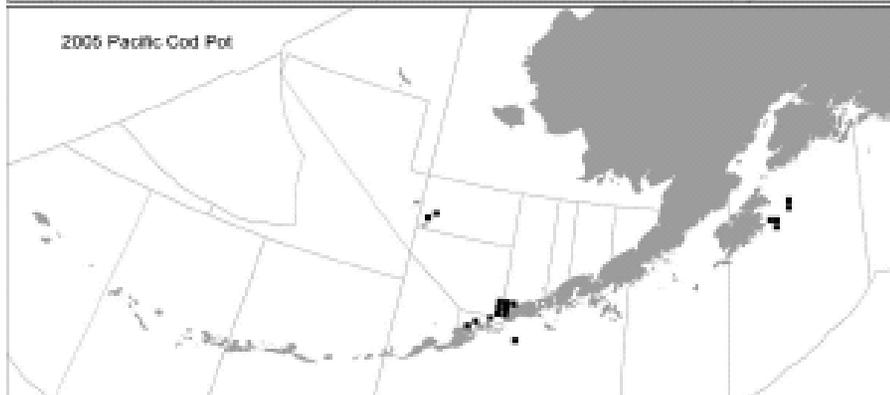
# 2005 Pacific Cod Fisheries



Trawl



Longline



Pot

# **Pacific Cod Assessment**

## **Notable Features**

### **1. Year 2006 Survey**

**EBS Trawl Biomass = 518,000 mt, down 14% from 2005**

### **2. Brand New SS2 Model Configuration**

**Substantial revision of last year's model and new data**

**8 Alternative configurations were tested**

**Plan Team agreed with the author's selection of the preferred model configuration (Model B1)**

### **3. Model Biomass**

**Female spawner biomass up 10% from last year's estimate**

**Total abundance is projected to continue to decline because of below average recruitments from 2001-2004 year classes**

**Tentative data shows higher 2005 YC**

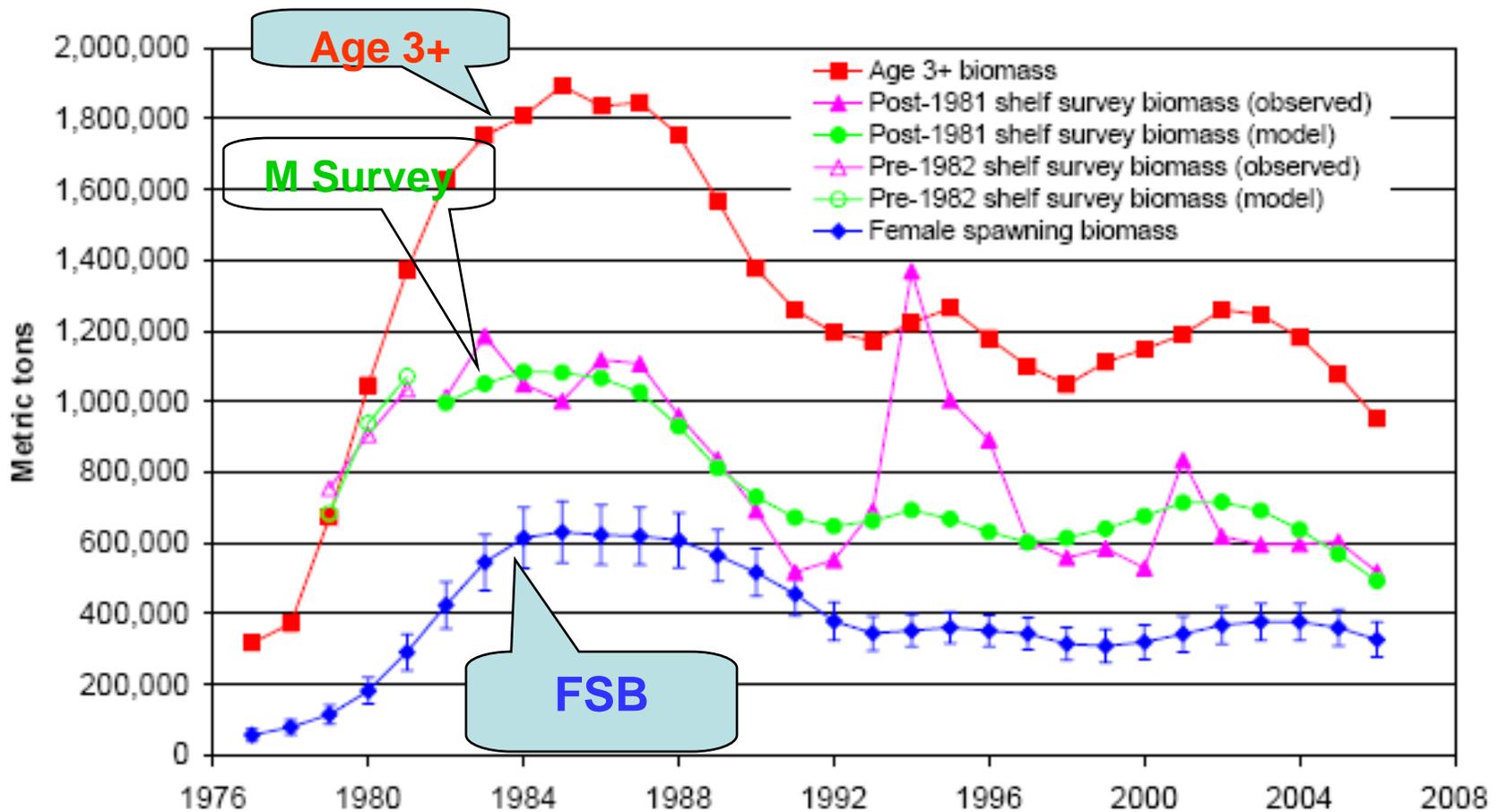
### **4. ABC for 2007 is based on Tier 3 calculations**

# **Pacific Cod Assessment**

## **Notable Features of Model Results**

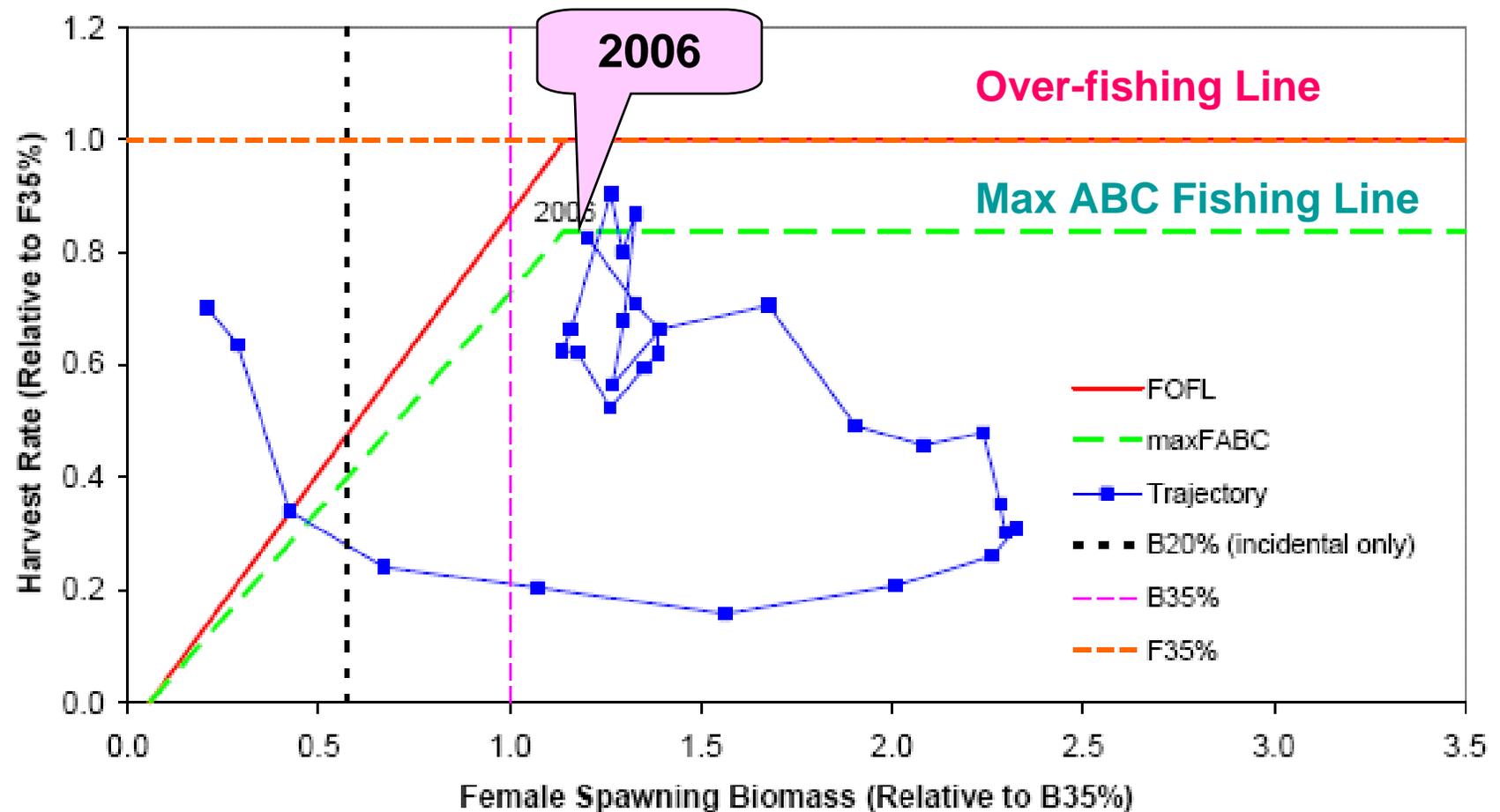
- 1. The 2000-2004 year classes are all weak**
- 2. Female spawning biomass has been fairly stable from 1993, although the trend is downward now.**
- 3. Models project continued declines in female spawning biomass and maximum permissible ABC for the next 2-3 years**

# Pacific Cod Model Biomass

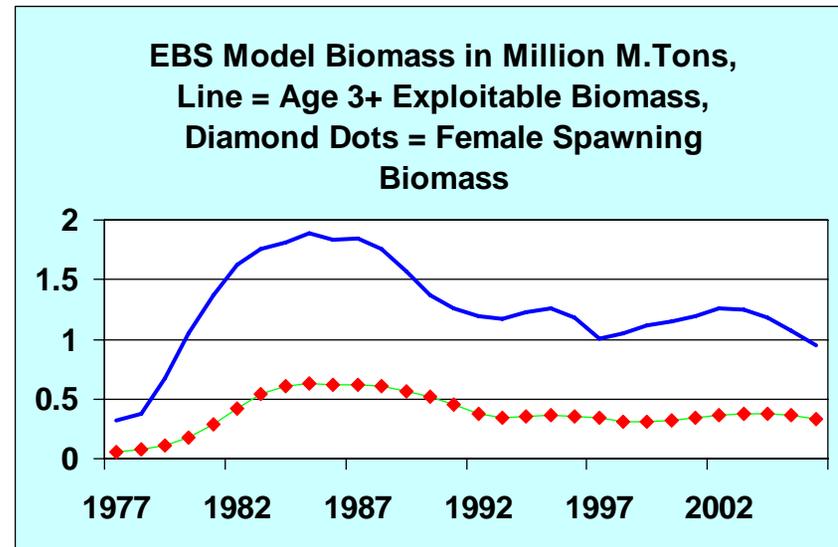
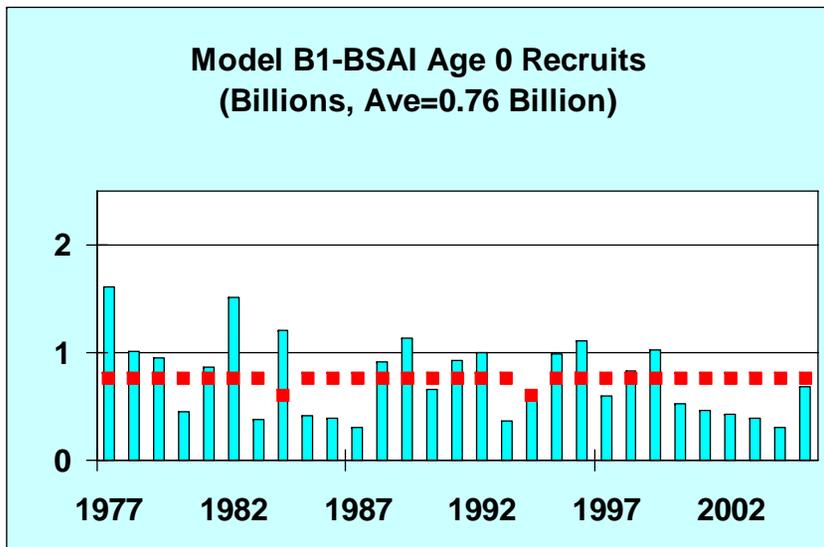
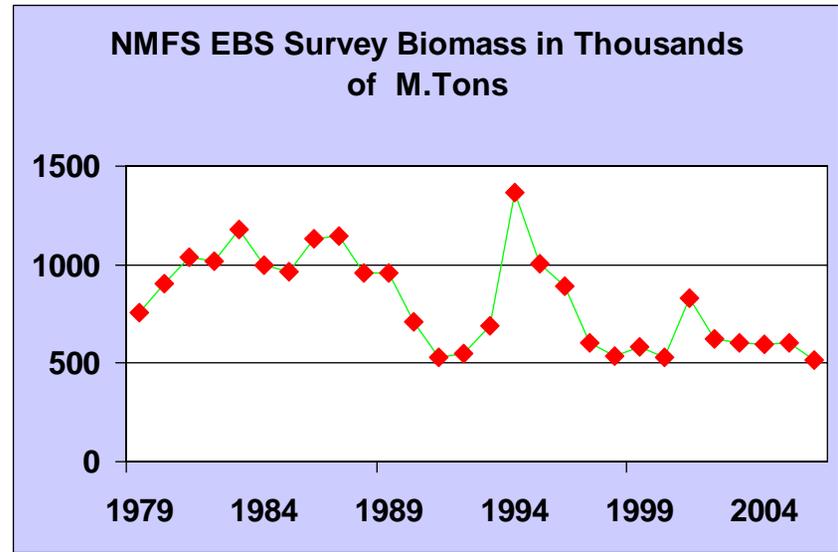
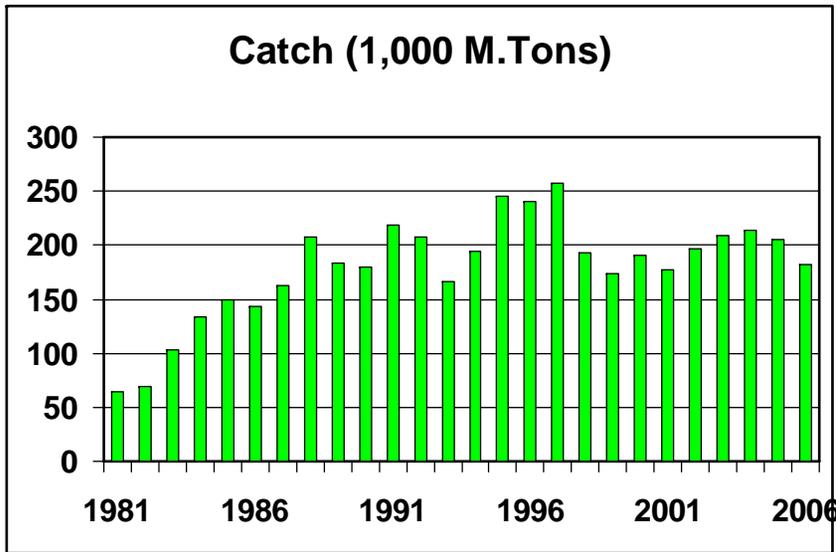




# Model B1 Trajectory of F and FSB, 1977-2006



# Pacific Cod Stocks Assessment, Dec 2006



# Sabalefish Assessment

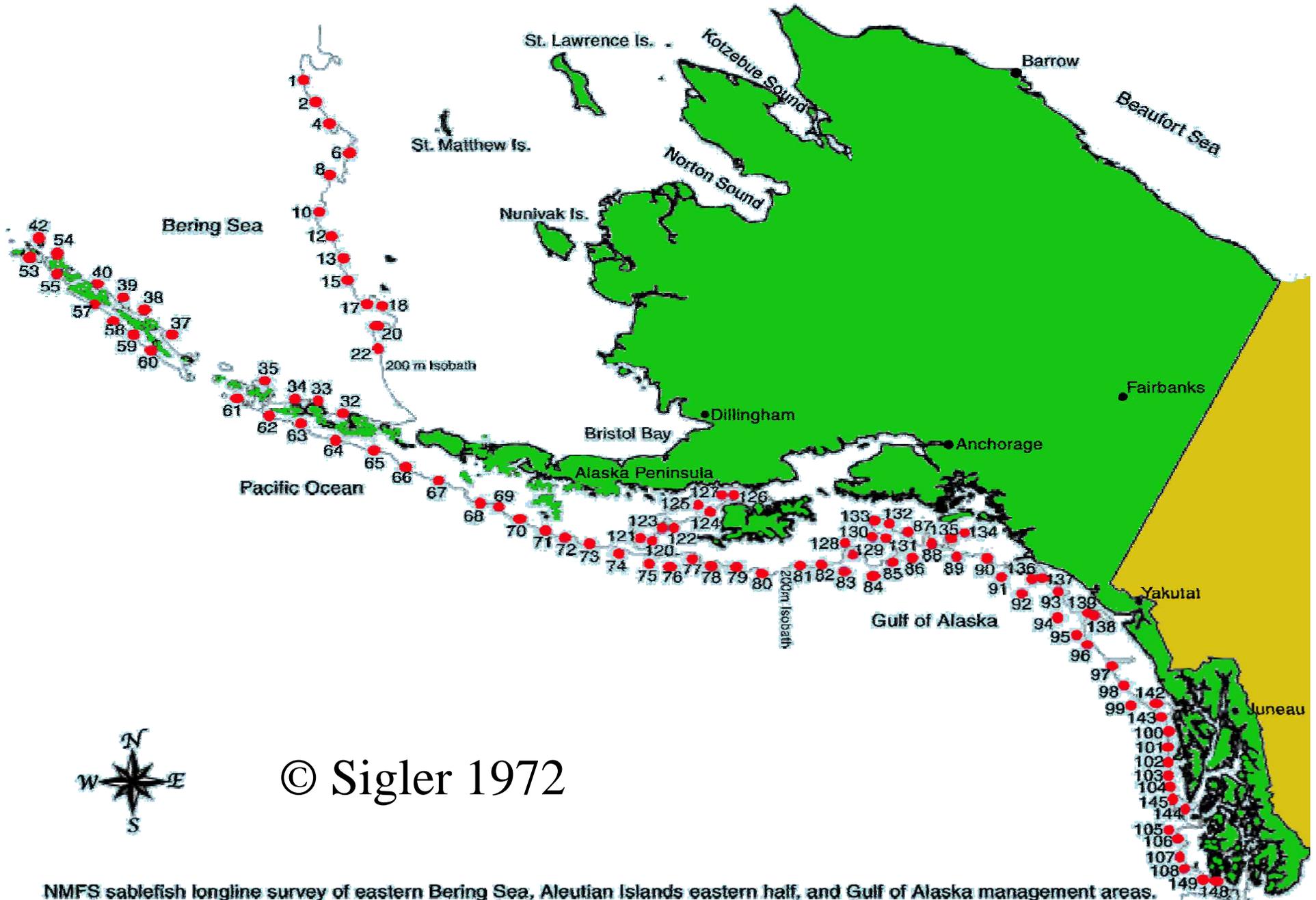
## Notable Features



1. **Year 2006 Standard Longline Surveys**
  - Survey abundance Index increased 8 % from 2005
  
2. **BSAI Stock Assessment is embedded in the Model for the Alaska-wide Single Stock**
  - This year's assessment incorporates split-sex analyses in model with several technical changes
  - Female Spawning Biomass projected to remain stable from 2006-07
  - Projected to remain stable from 2005 to 2006.
  - The 1997 and 2000 Yr classes each contributes 13% of the stock biomass
  
3. **ABC is based on Tier 3b**

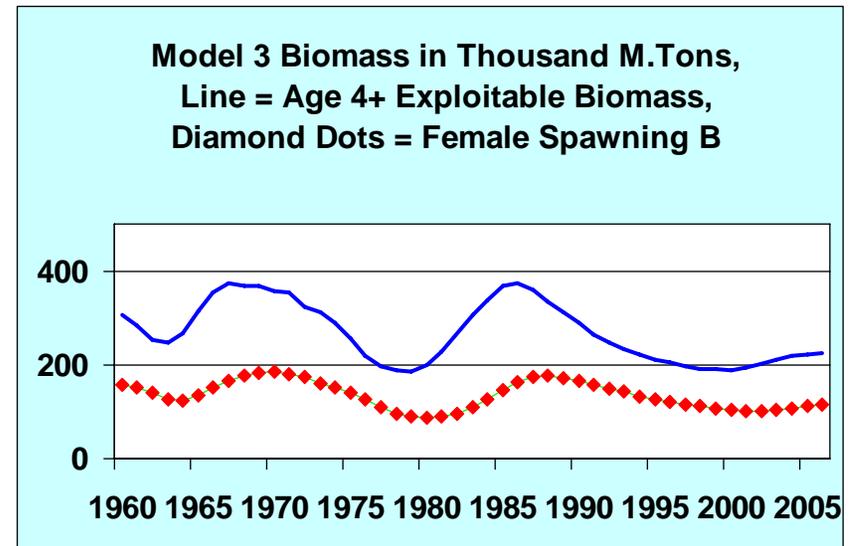
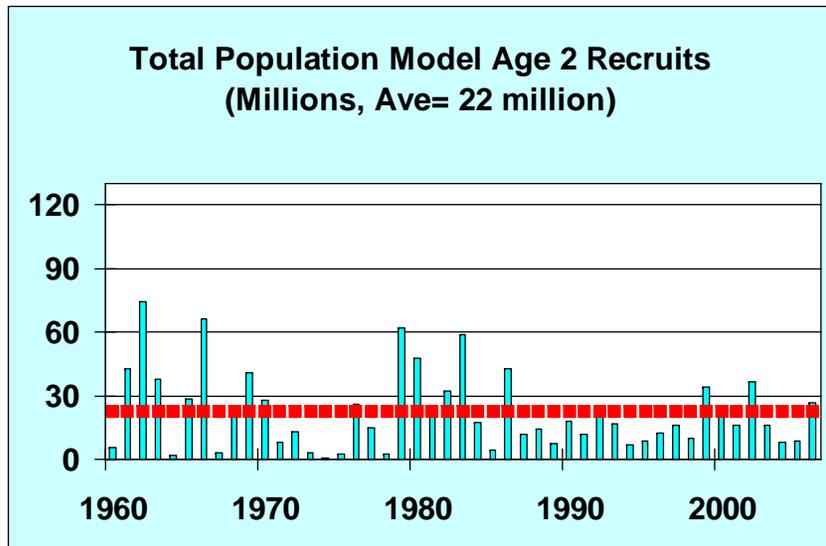
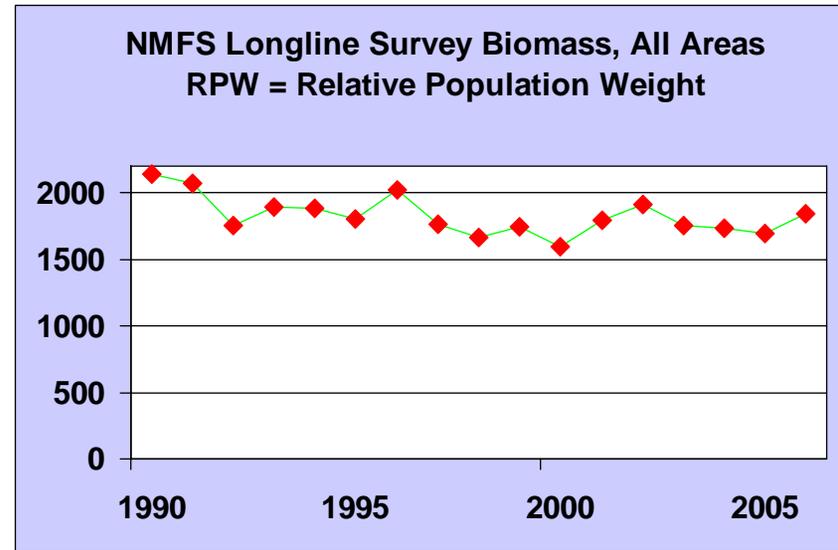
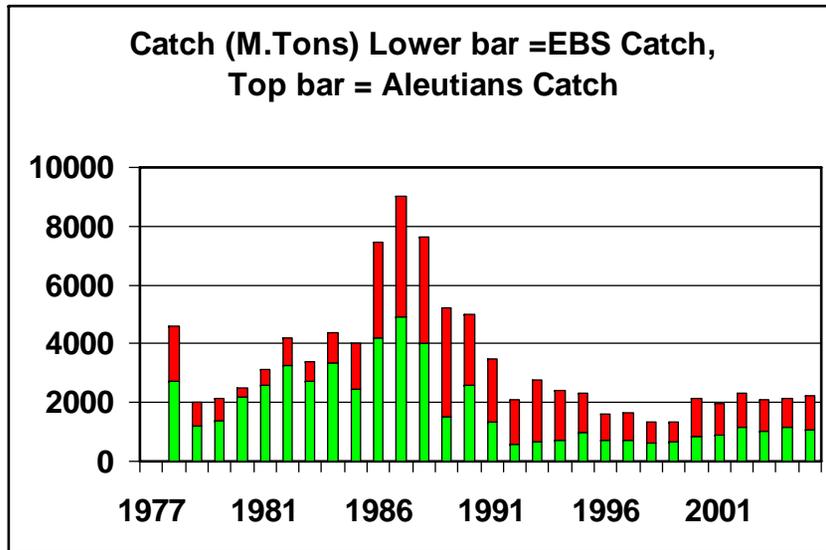
Apportionment of ABC to EBS and Aleutians is based on Relative Population Weight based on the surveys

# NMFS Longline Survey



NMFS sablefish longline survey of eastern Bering Sea, Aleutian Islands eastern half, and Gulf of Alaska management areas.

# Alaska-wide Sablefish Stock Assessment, Dec 2006



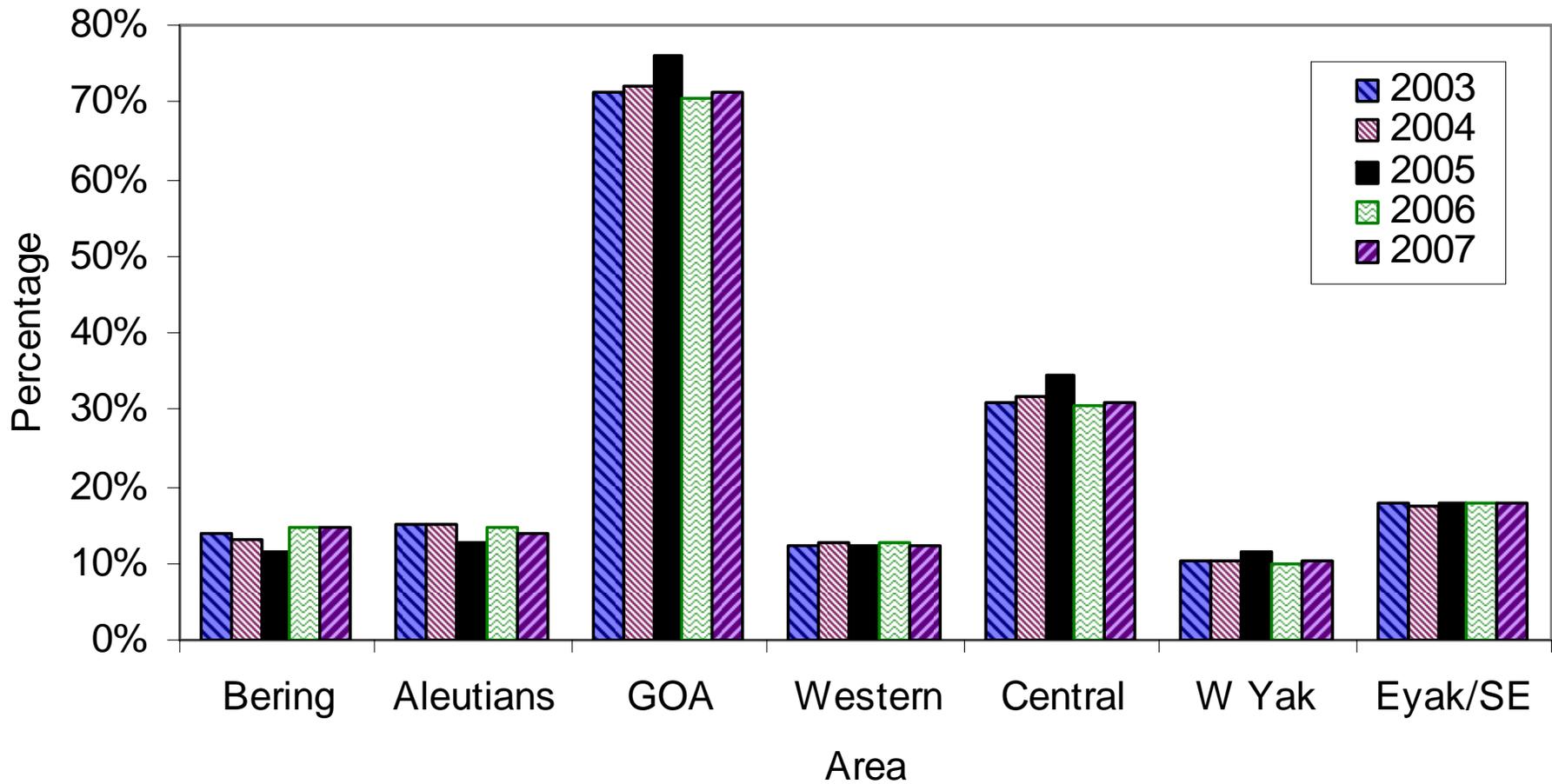
**Authors' recommendation**

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<b>F</b>	<b>0.088</b>	<b>0105</b>
<b>ABC</b>	<b>20.1</b>	<b>21.0</b>

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Apportionment percentages for 2003-2007



# Flatfish Complex

## Overview of the Complex

### 1. Survey Biomass

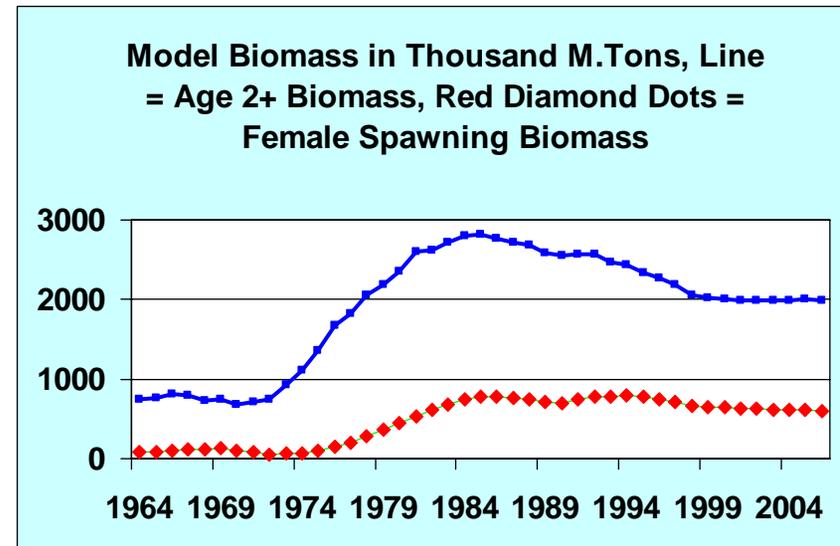
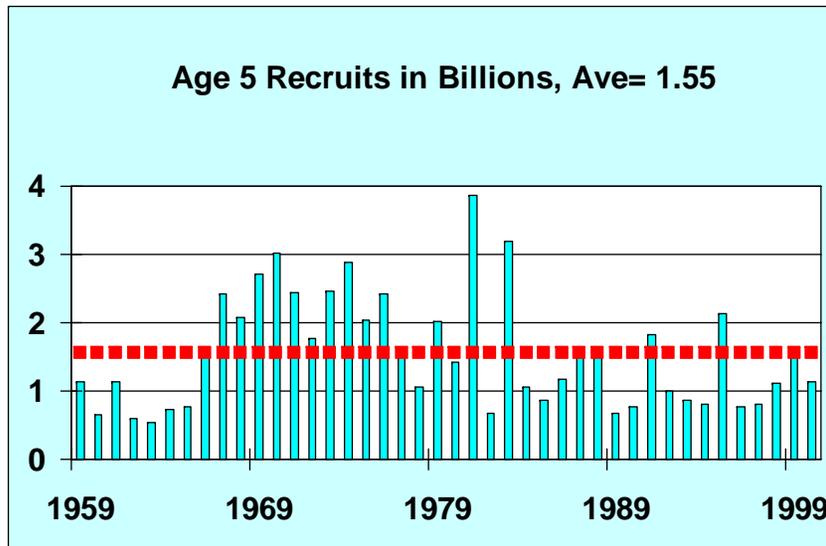
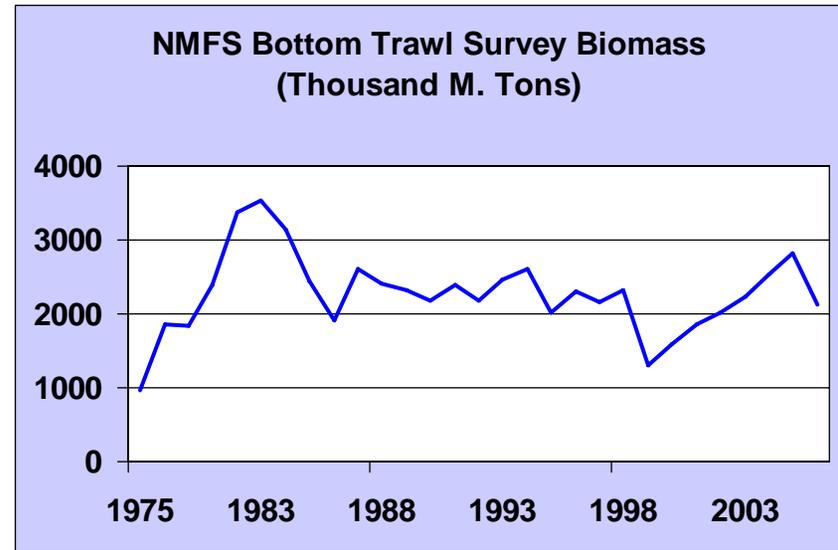
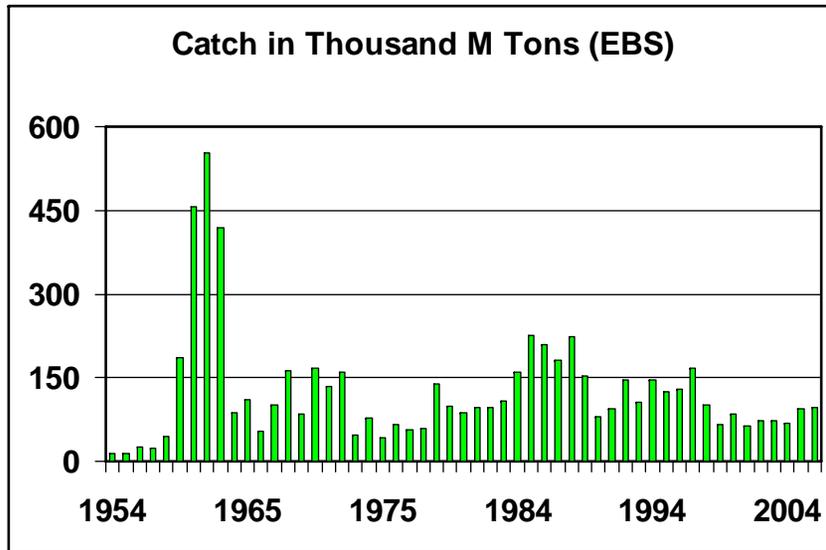
- High biomass, 14 % increase from 2005
- Flatfish Biomass now 45% of total Groundfish B,
- Flatfish Biomass now larger than that of pollock
- Greenland Turbot, a deep water flatfish, remains down
- Arrowtooth Flounder biomass rising rapidly, 17% of Flatfish B.

### 2. Models

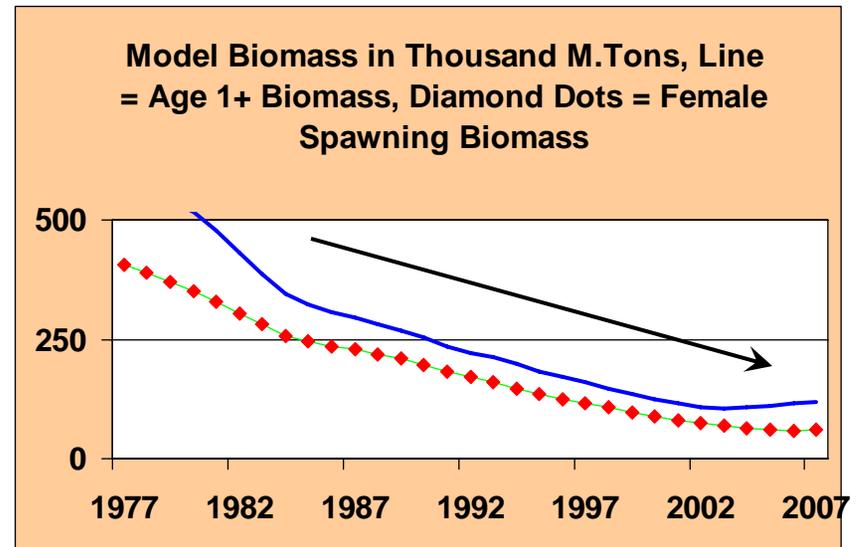
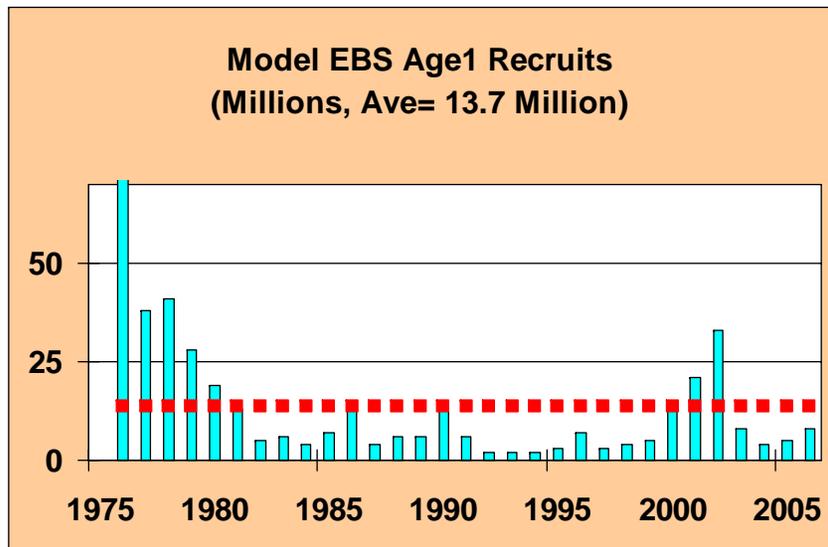
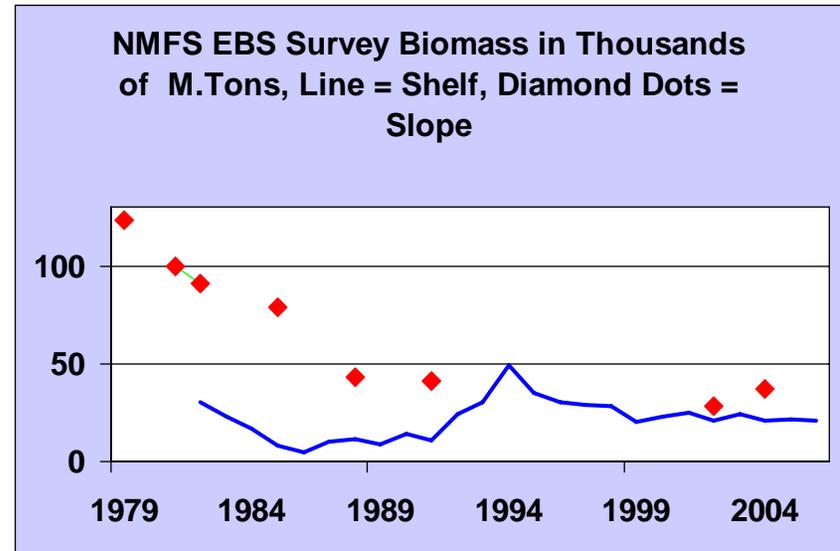
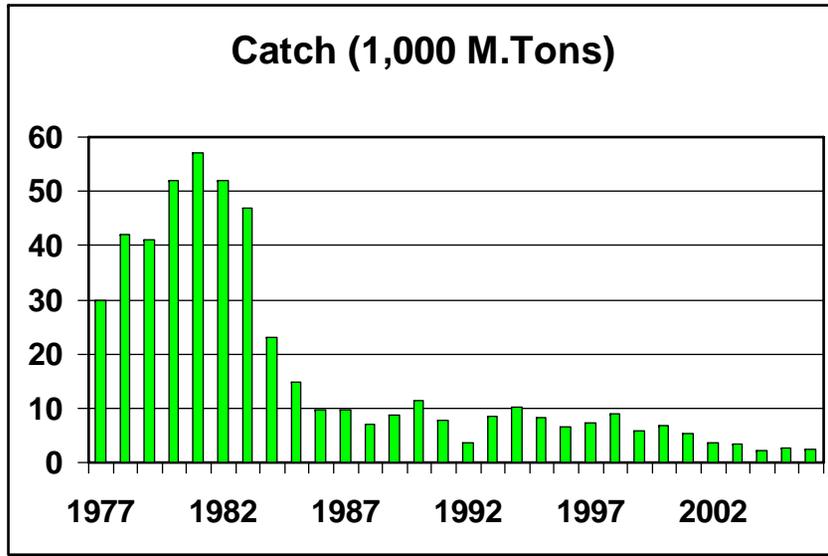
- Developed for most of the species
- Modeled by split sexes, as appropriate
- Catchability Coefficient is Adjusted for water temperature

### 3. **TACs have been set substantially below maximum possible ABCs, even for Greenland Turbot**

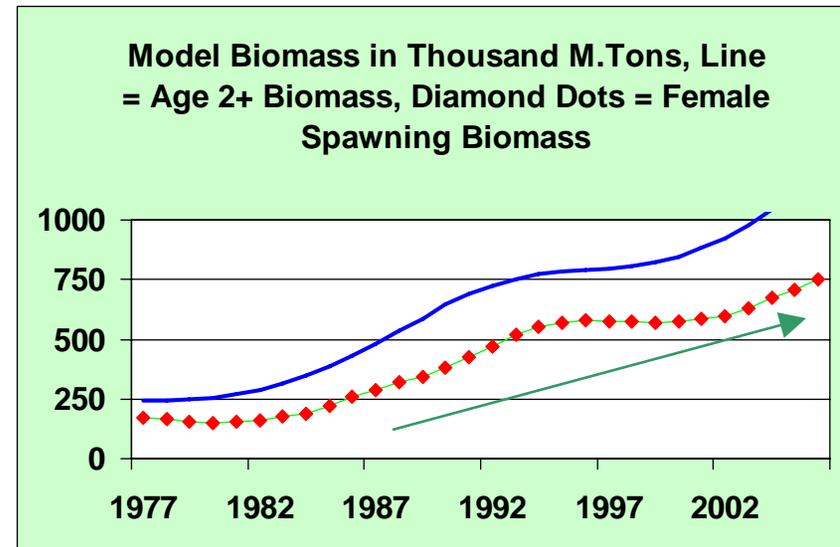
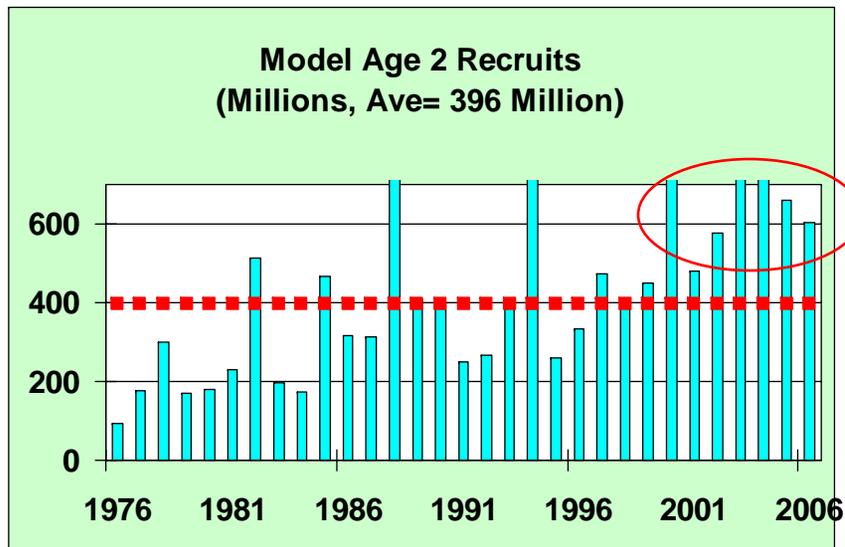
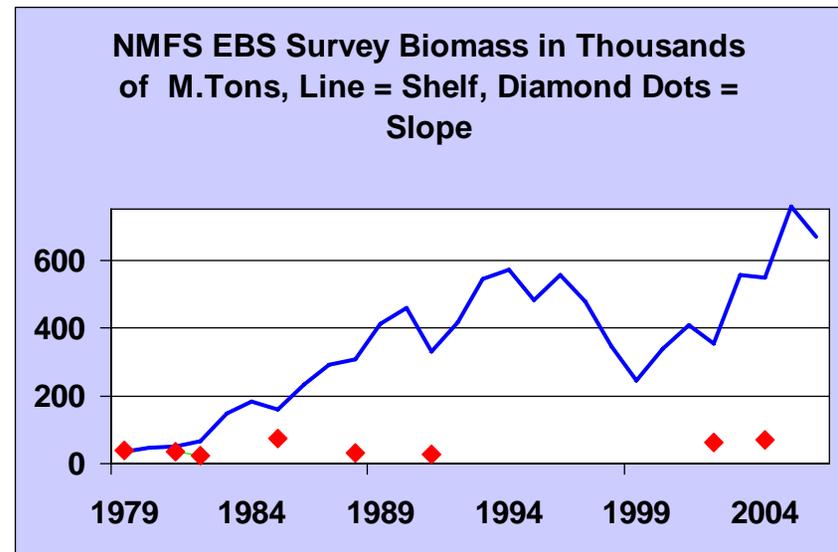
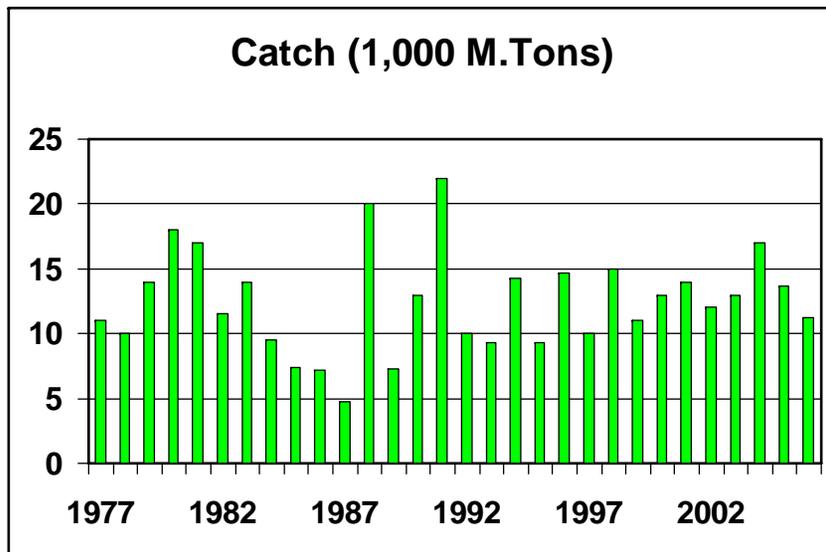
# Yellowfin Sole Stock Assessment, Dec 2006



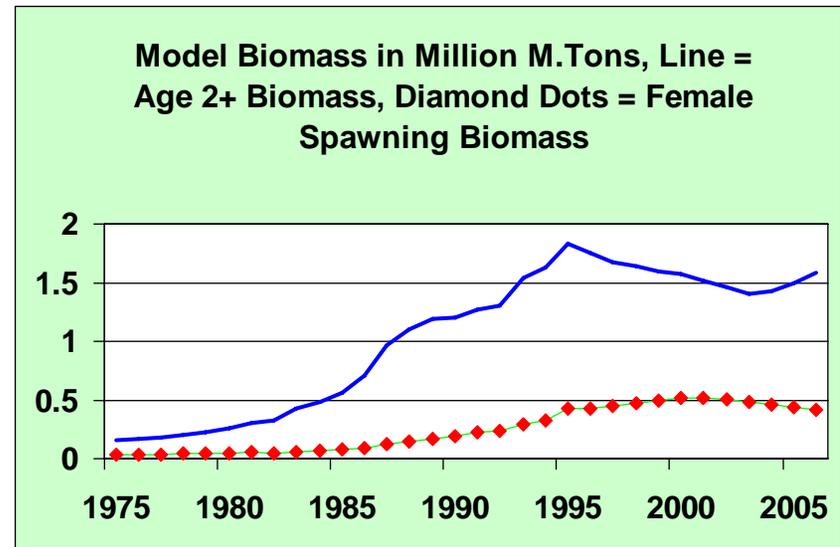
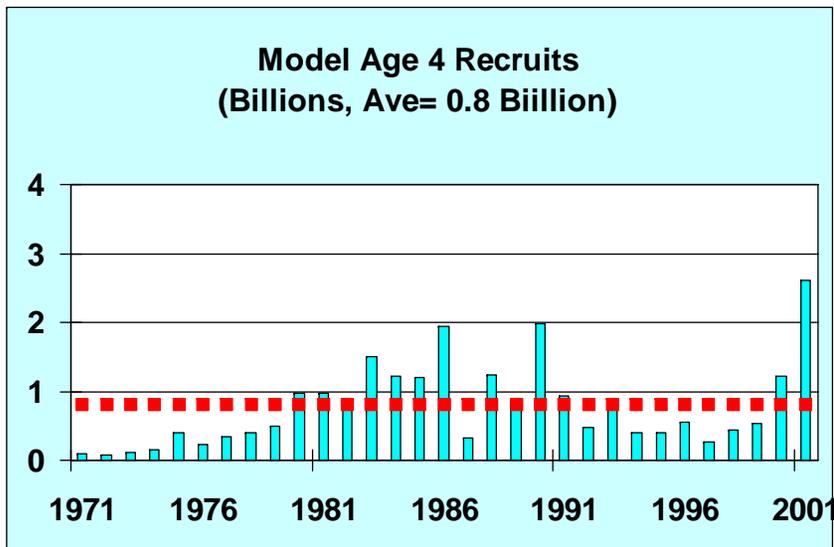
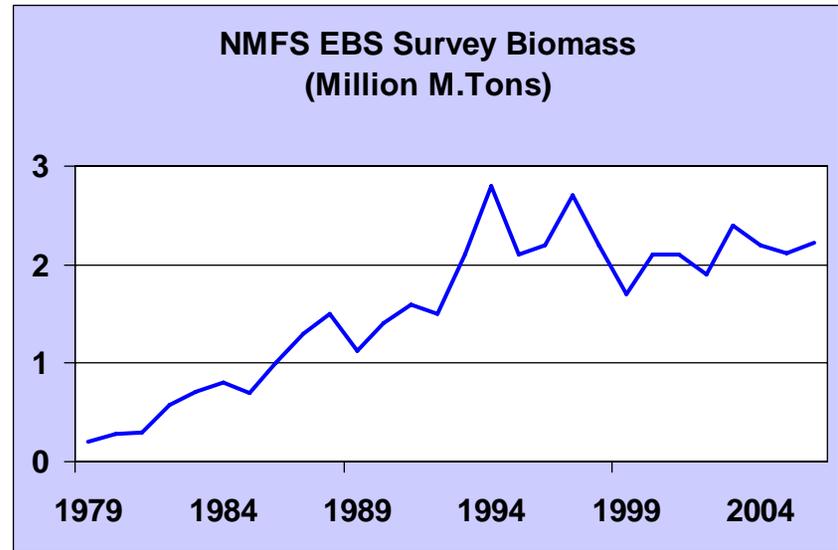
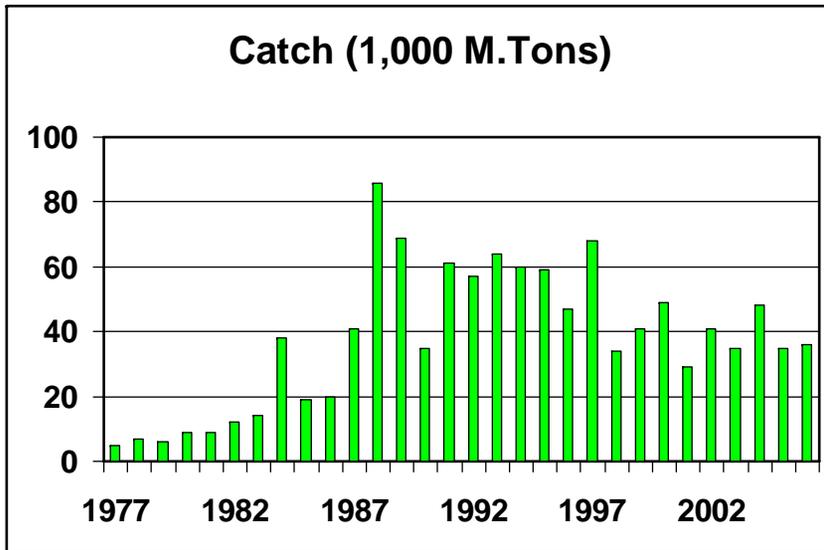
# Greenland Turbot Stock Assessment, Nov 2006



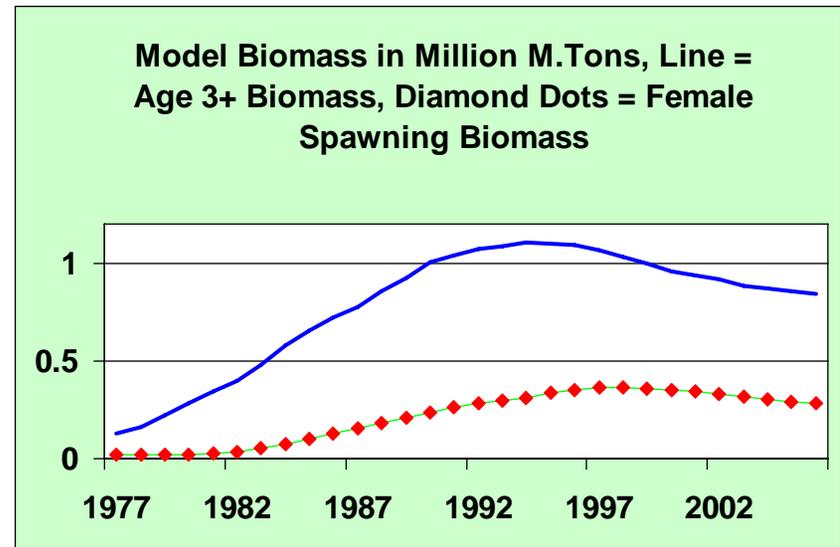
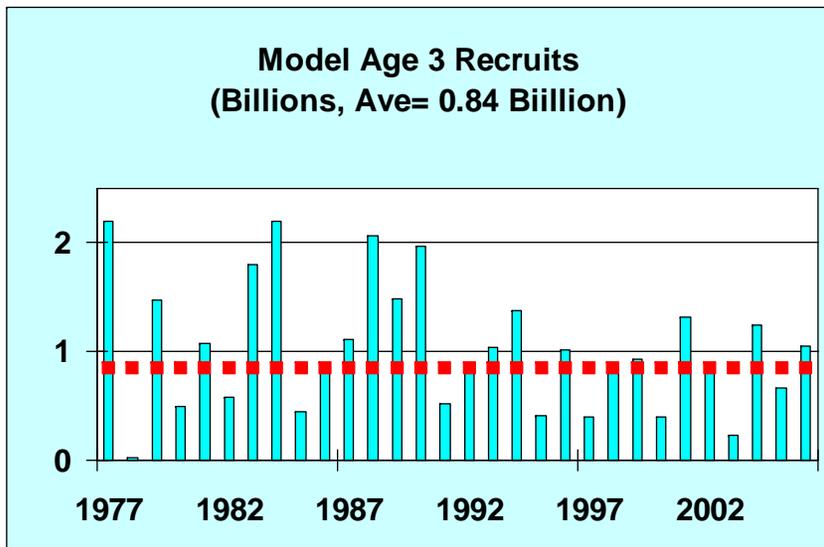
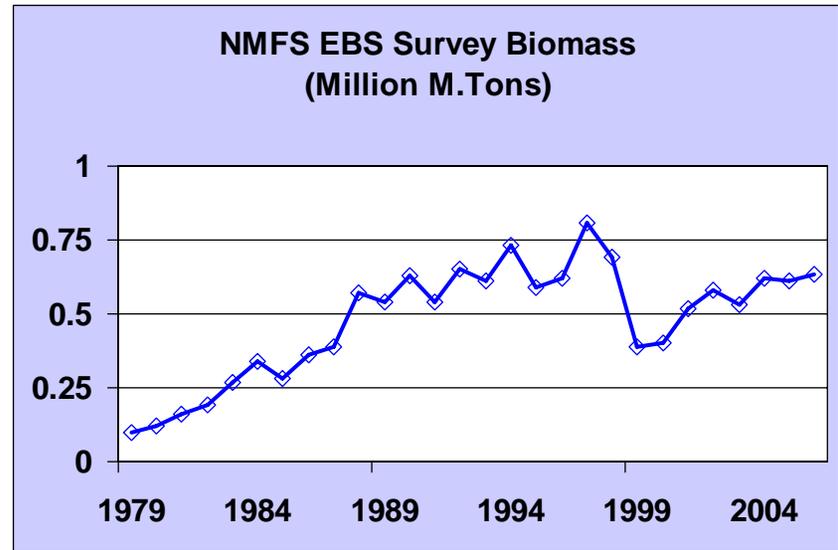
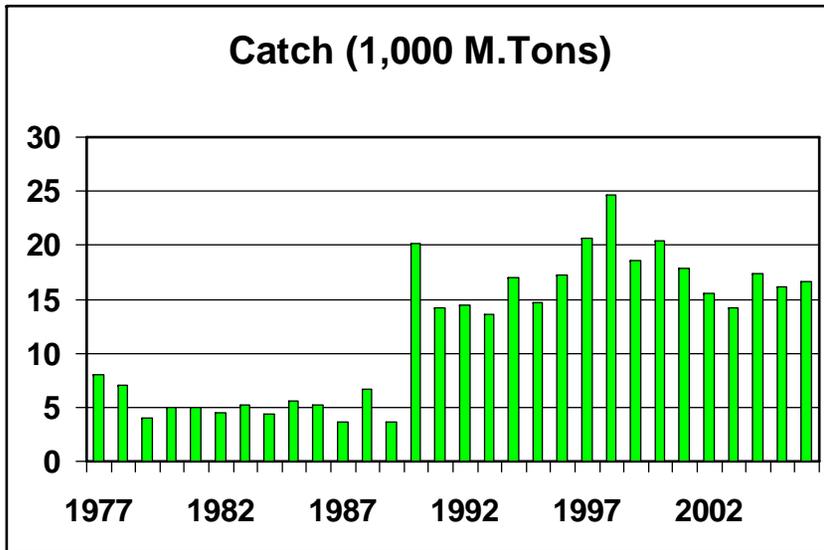
# Arrowtooth Flounder Stock Assessment, Dec 2006



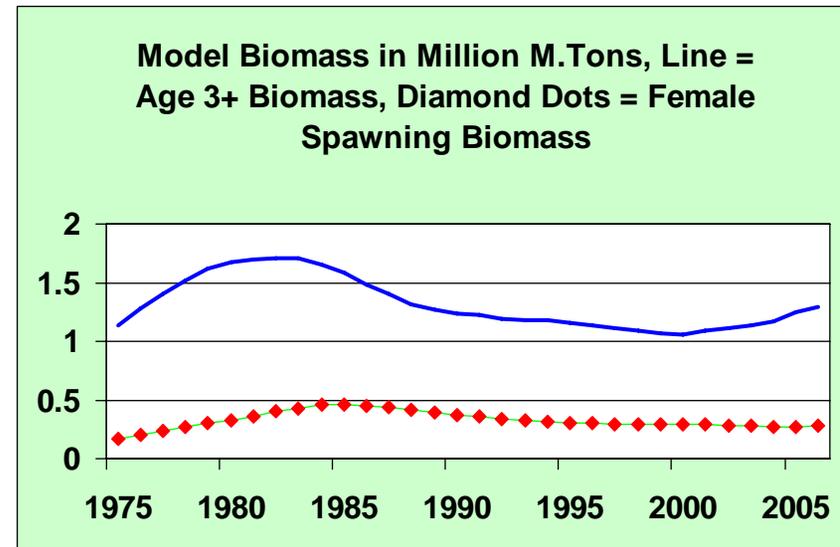
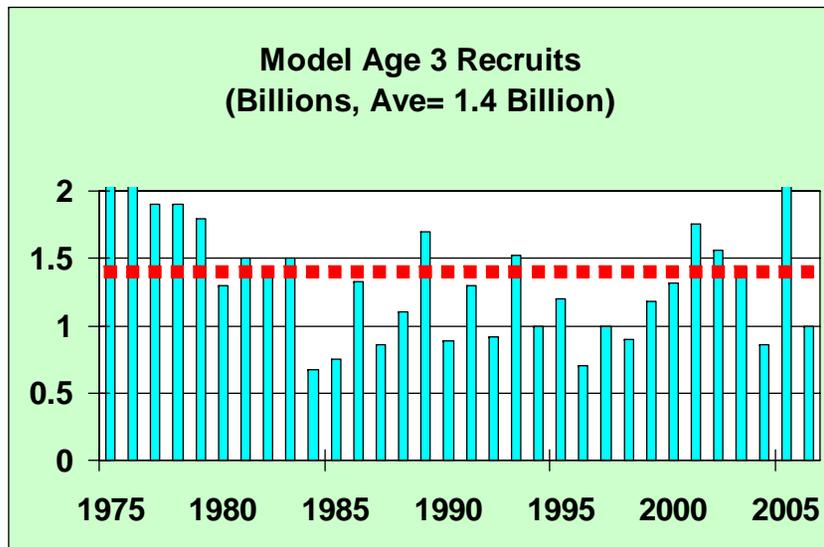
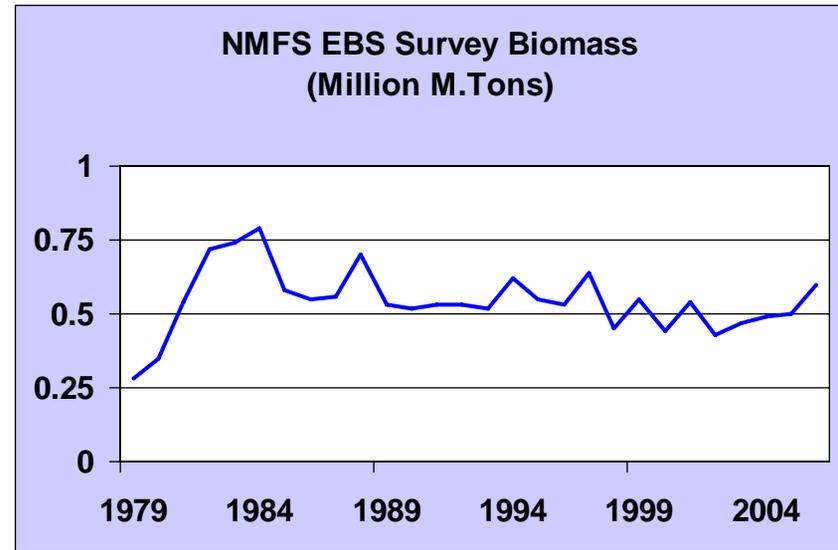
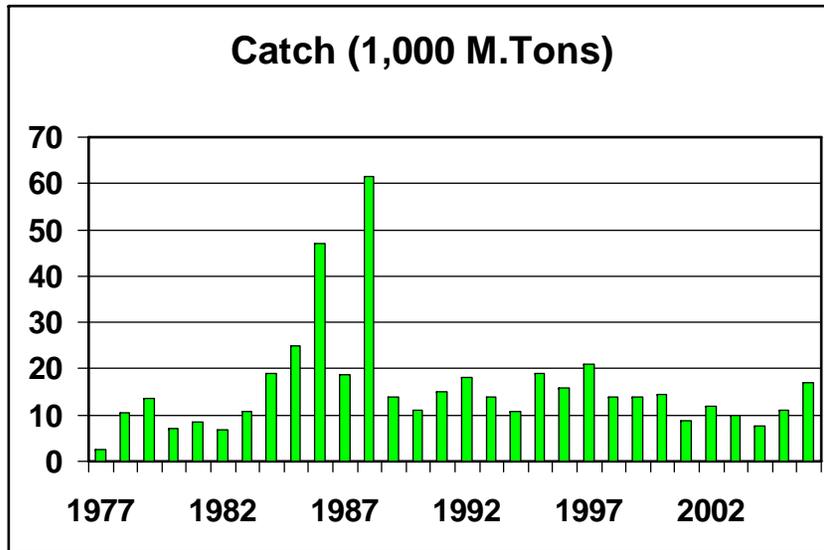
# Rock Sole Stock Assessment, Dec 2006



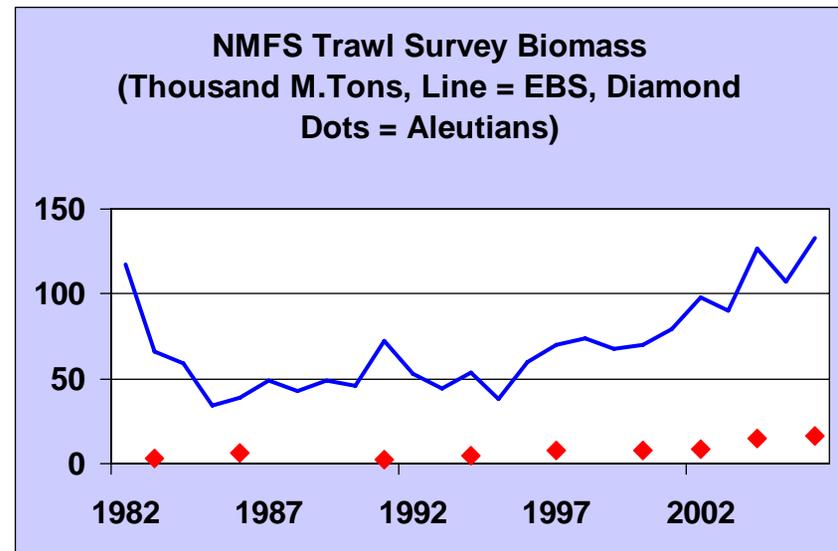
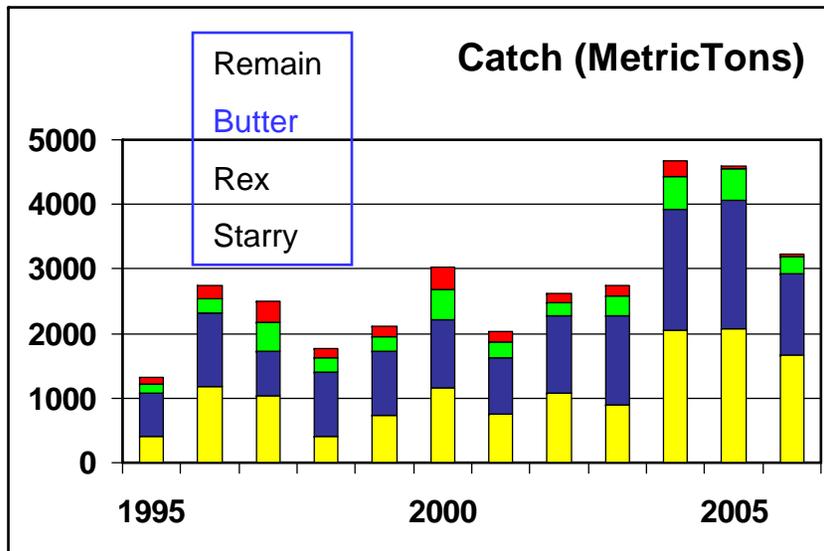
# Flathead Sole Stock Assessment, Dec 2006



# Alaska Plaice Stock Assessment, Dec 2006



# Other Flatfish Group Assessment, Dec 2006



**Model Biomass and Recruitment Estimations are not Available**

## Assessment Features

### 1. Species Composition

- 16 species from EBS, 5 species from Aleutians, 91% of 2006 catch are starry flounder and rex sole

### 2. Biomass Estimates from Surveys only

- Rather Stable to Increasing Trend in recent years in both regions

# Rockfish Assessments

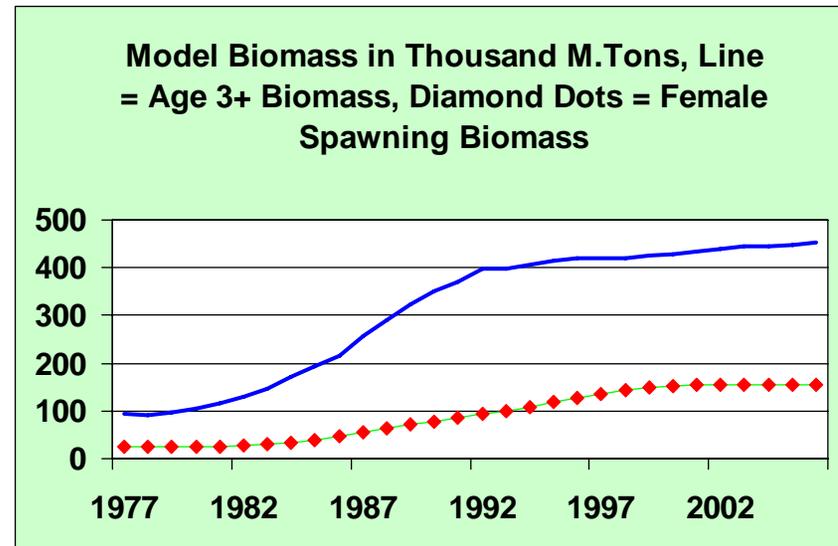
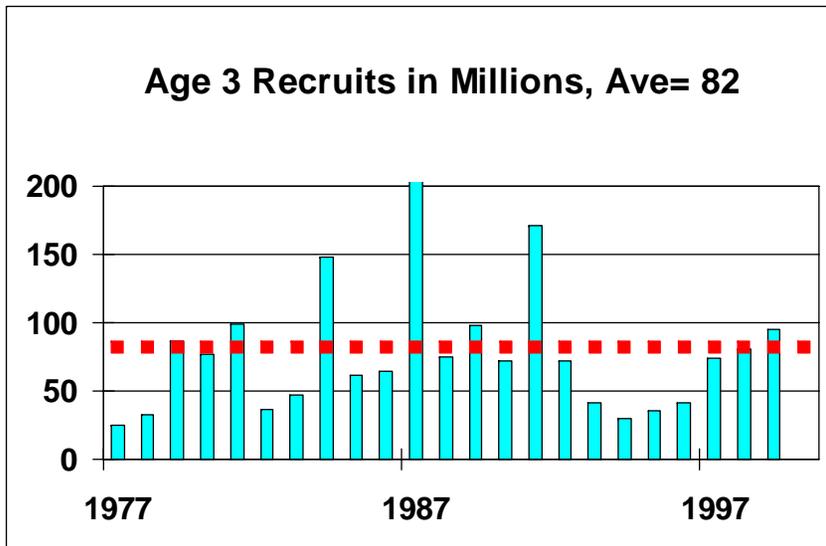
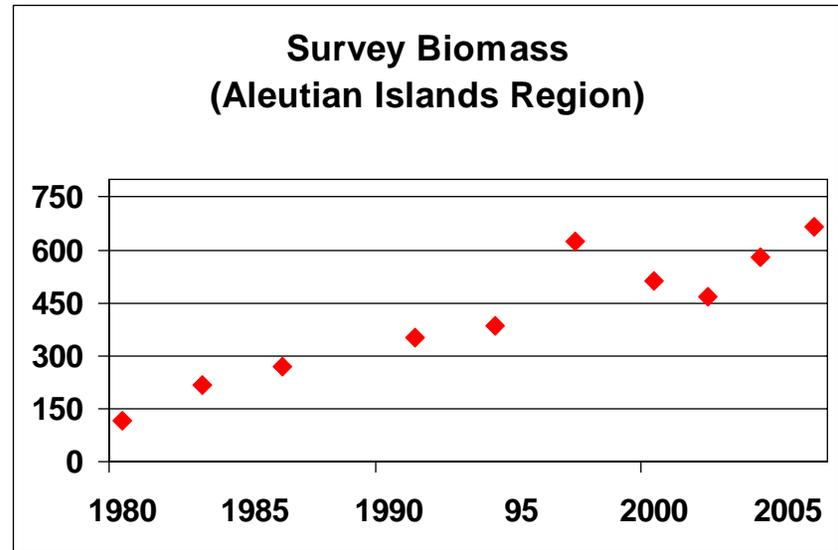
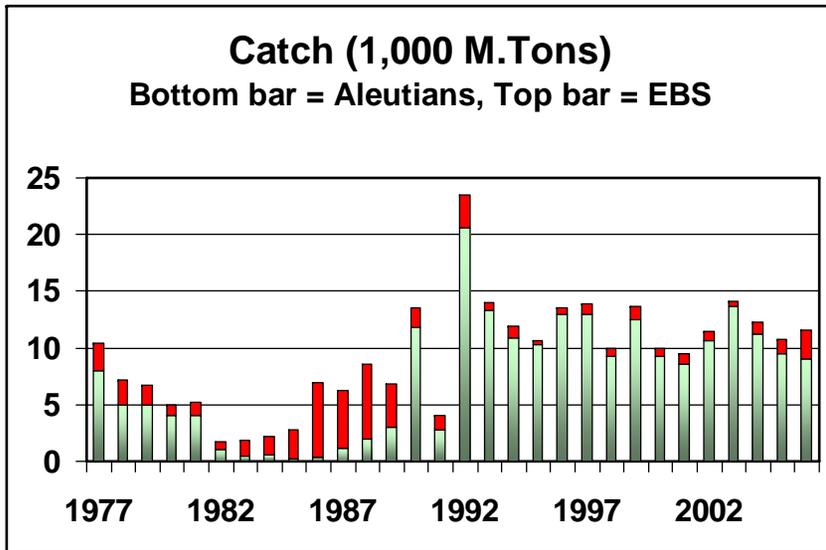
1. Major Updates of Rockfish Assessment are on 2 year cycle to coincide with Aleutian Islands surveys
2. Planned EBS slope survey for 2006 was cancelled

	2004	2006	Change
POP	580	667	+15 %
Northern RF	192	218	+14 %
Shorthead (AI)	33	12	-64 %
Rougheye (AI)	15	10	-37 %
Other Rockfish (AI)	25	27	+ 8 %

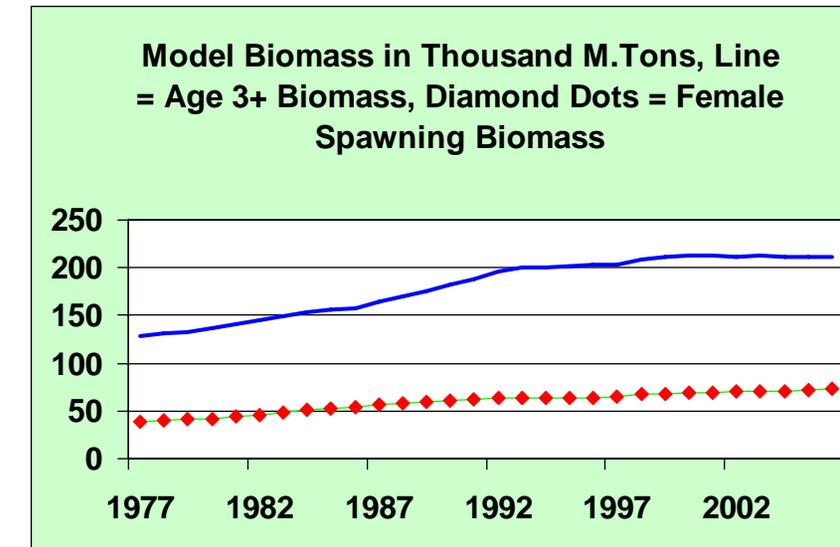
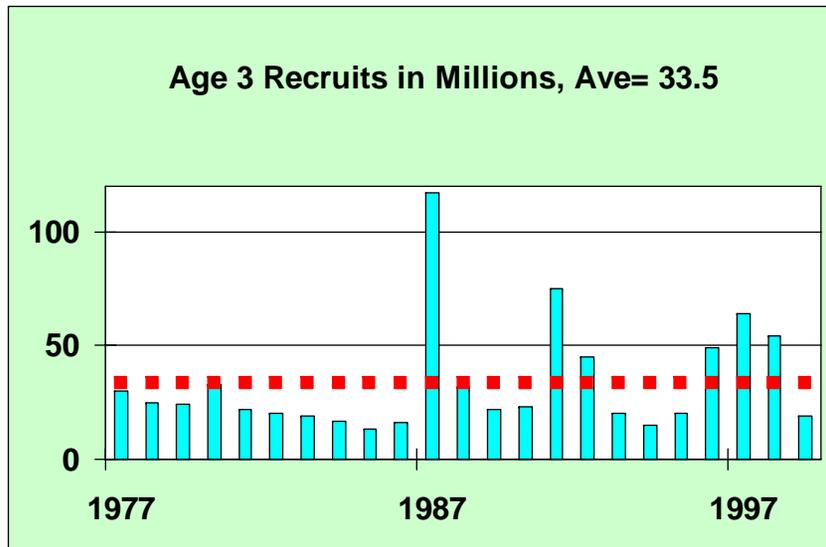
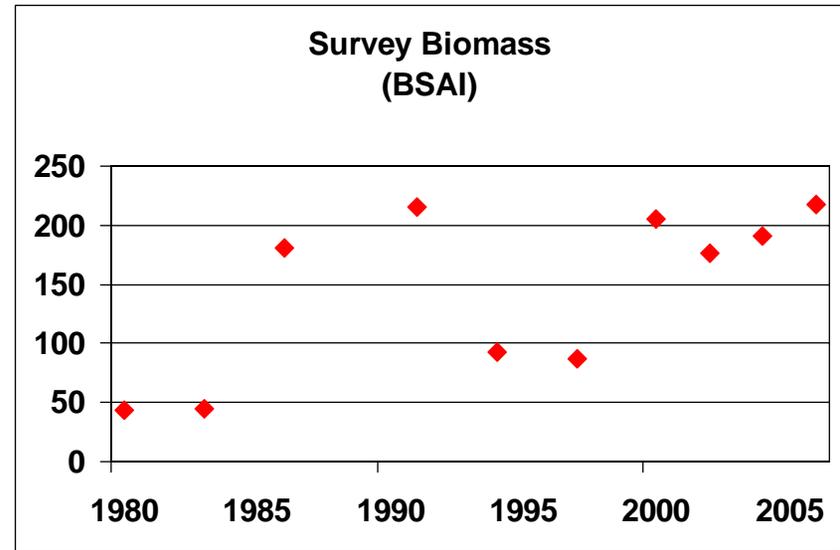
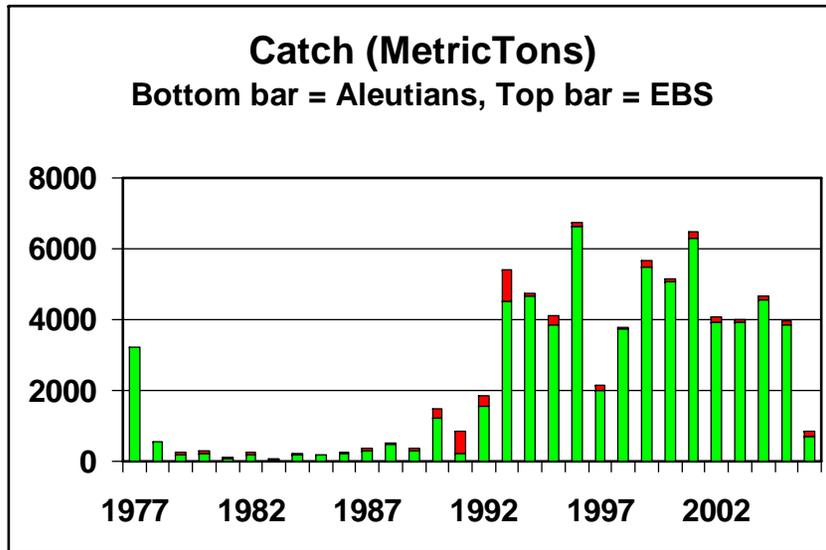
# Rockfish Assessments

1. **Model assessments for POP and Northern Rockfish groups only -- ABCs calculated under Tier 3.**
  - a. **ABC for POP is up 48%, half increase due to survey biomass going up 15% and half due to change in M from 0.04 to 0.06 that is internally estimated by model**
  - b. **ABC for Northern Rockfish is down 4% even though survey biomass is up 14%. ABC is down due to internally calculated M dropping from .05 to .045**
  
2. **ABCs for all other rockfish groups are dependent directly on survey biomass under Tier 5 calculations, where  $ABC = 0.75M \times \text{Biomass}$**

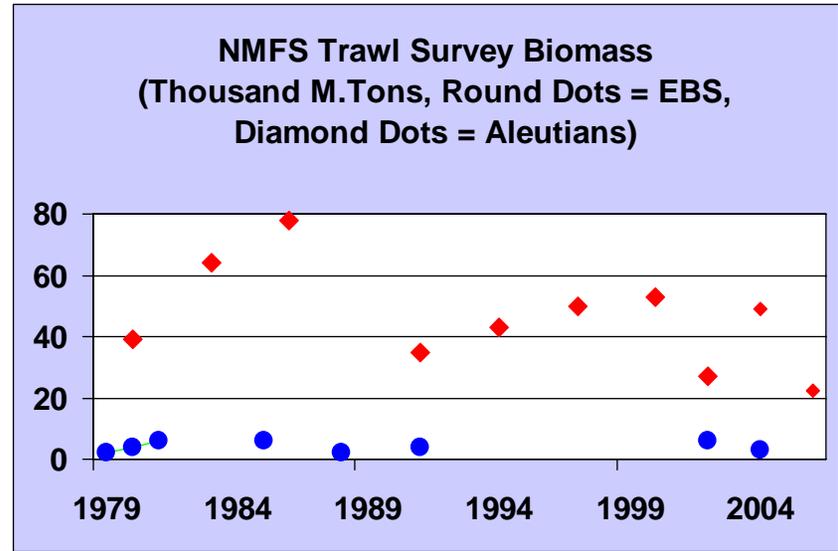
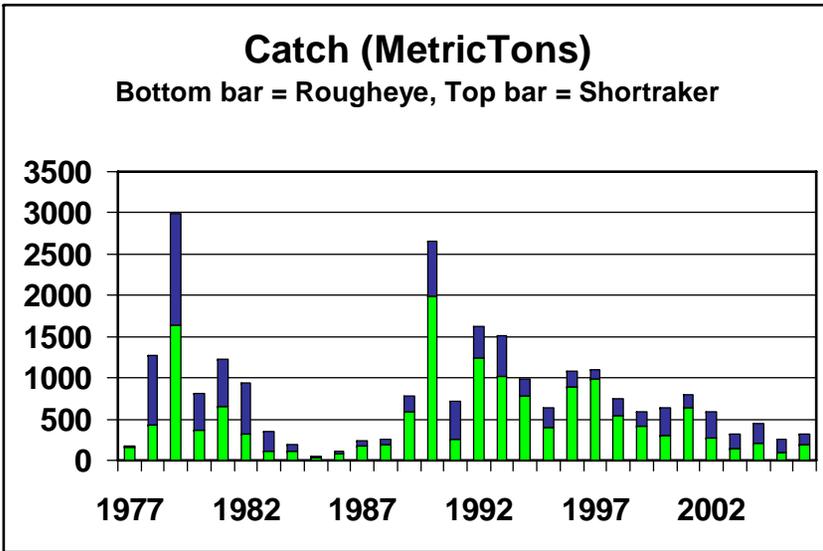
# Pacific Ocean Perch Stock Assessment (Dec 2006)



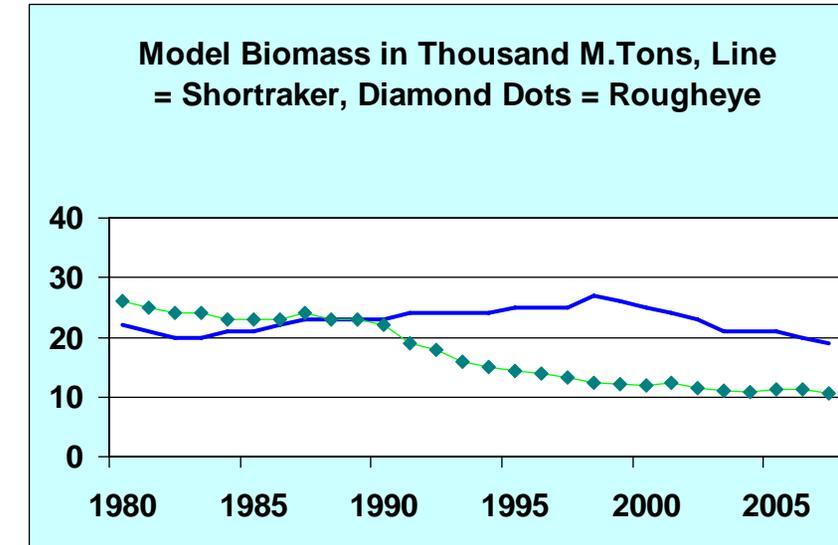
# Northern Rockfish Stock Assessment (Dec 2006)



# Shortraker & Rougheye Assessments (Dec 2006)



Recruits Estimation  
(Not Available)

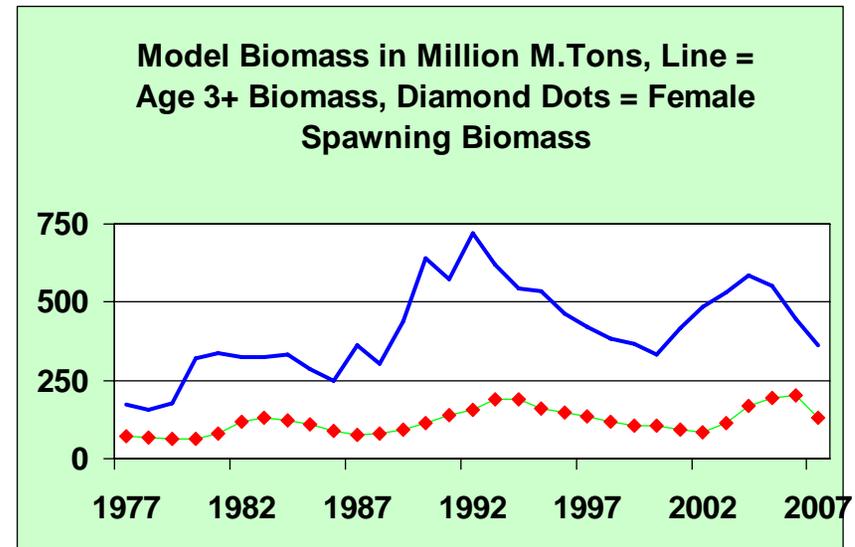
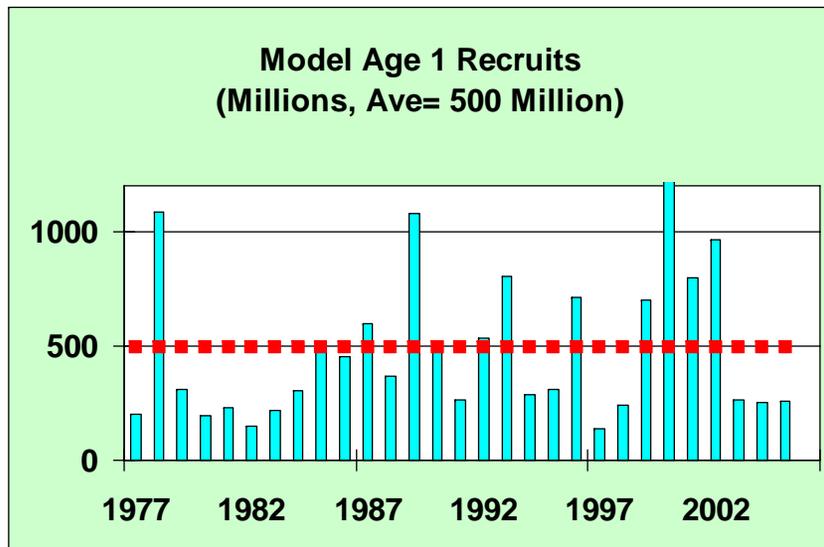
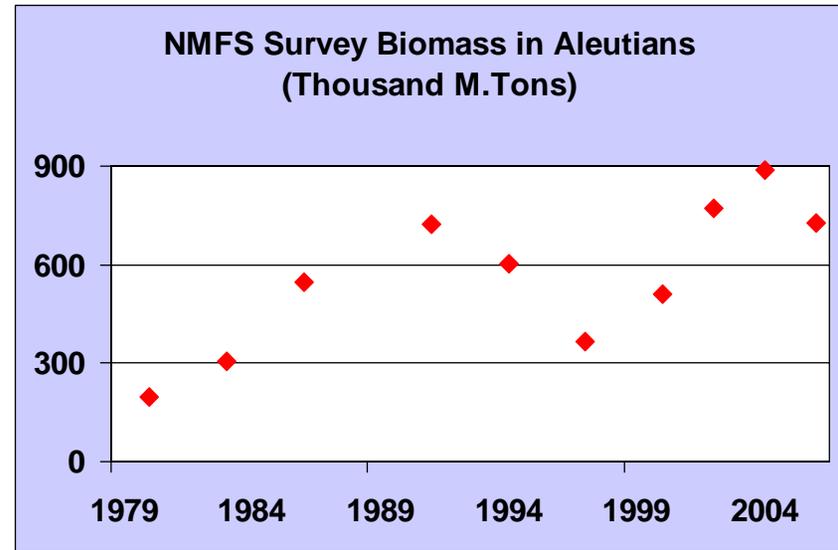
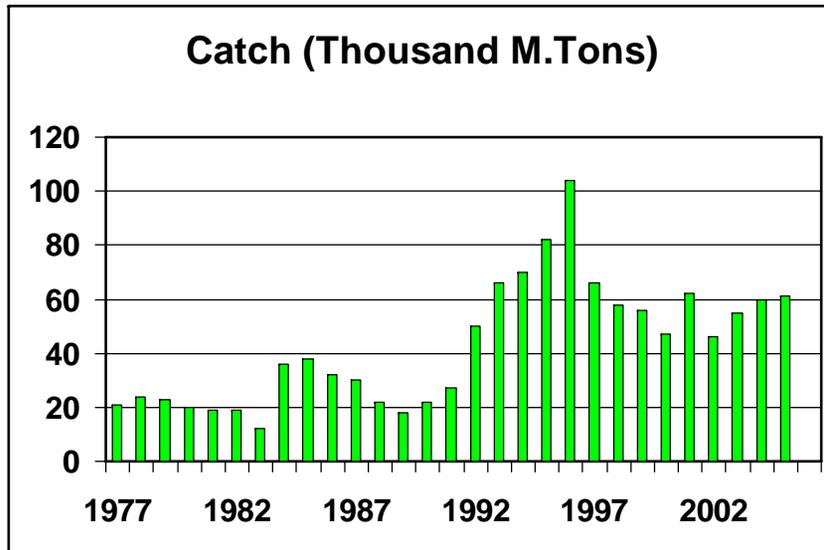


# **Atka Mackerel Assessment**

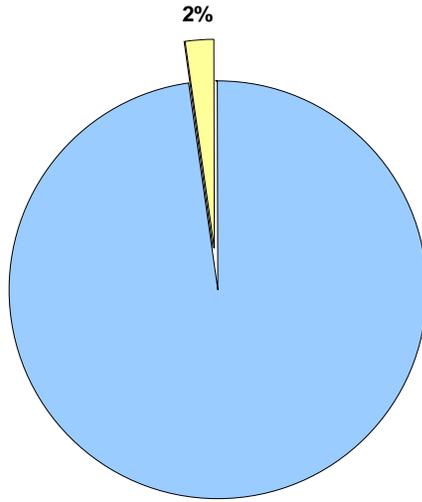
## Notable Features, Chapter 15

1. Straight update of last year's assessment
2. Survey Biomass 2006 = 728,900 mt;  
down 18% from 2006
3. Recruitment of all 3 most recent year  
classes (2002-2004) are below average
4. ABC is apportioned by 3 Aleutian Areas;  
Eastern (32 %), Central (40 %), and  
Western (28 %)

# Atka Mackerel Stock Assessment, Dec 2006



# Squid and Other Species Resources December 2006 Assessments

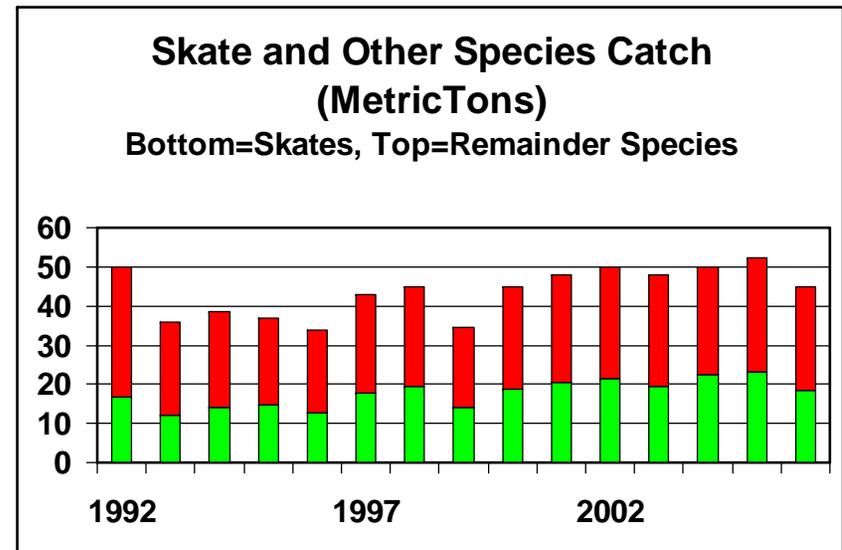
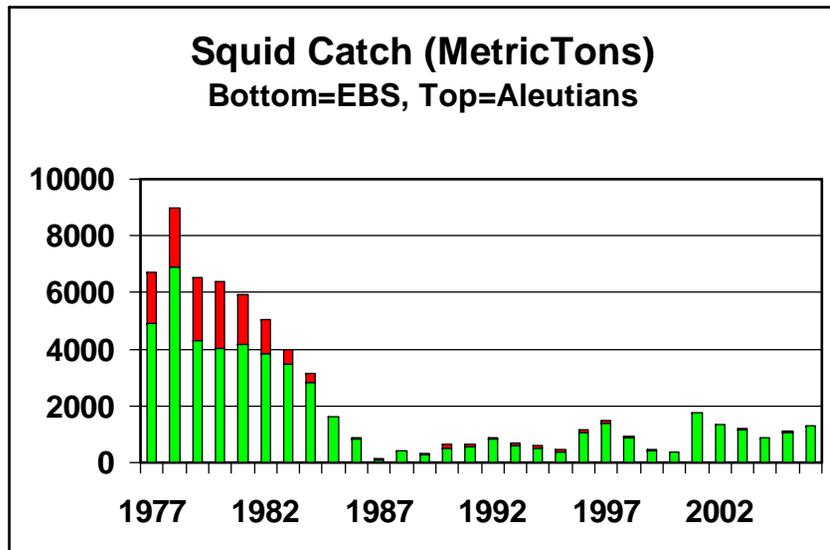


**Recent Average  
Groundfish Catch =  
1.9 + mmt**

**Squid = 1,300mt**

**Skate & Others =  
44,200 mt**

**Combined = 2.4 %**



# Squid and other species Assessment

## Notable Features, Chapters 16-19

### 1 Squid ABC is calculated under Tier 6

.... average catch from 1977-1995, ABC = 1,970 mt

### 2. Other species: author recommends managing by major taxonomic groups under Tier 5

Species	Biomass (mt)	ABC (mt)
Sharks	18,800	1,300
Skates	492,000	36,900
Sculpins	217,000	30,900
Octopus	7,000	2,900
Total	734,000	71,900

### 3. Plan Team and Authors recommend management by Break-out Species groups

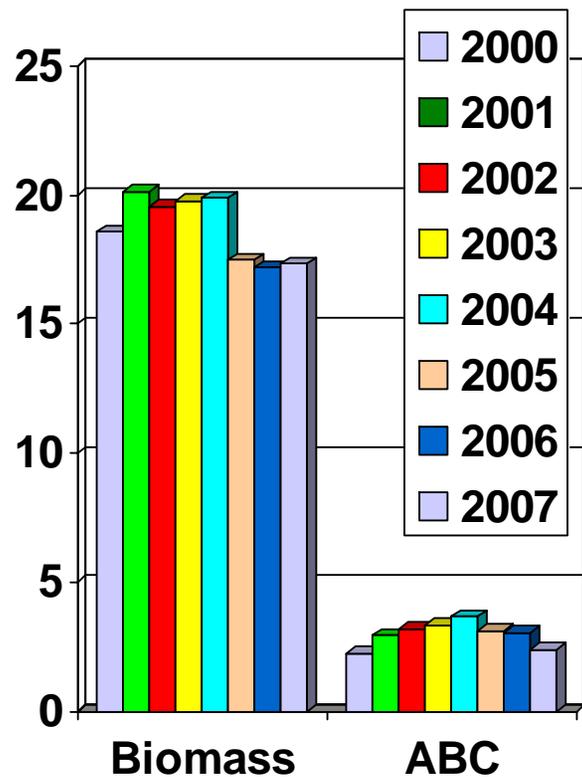
# Adjustments to ABCs

- due to Special Ecosystems Concerns

1. The Team did not make specific adjustments to ABCs for ecosystem concerns
2. General Concerns about ecosystem considerations have already been built into the Analyses
3. Ecosystems evaluations have been more extensive each year

# BSAI Groundfish Complex

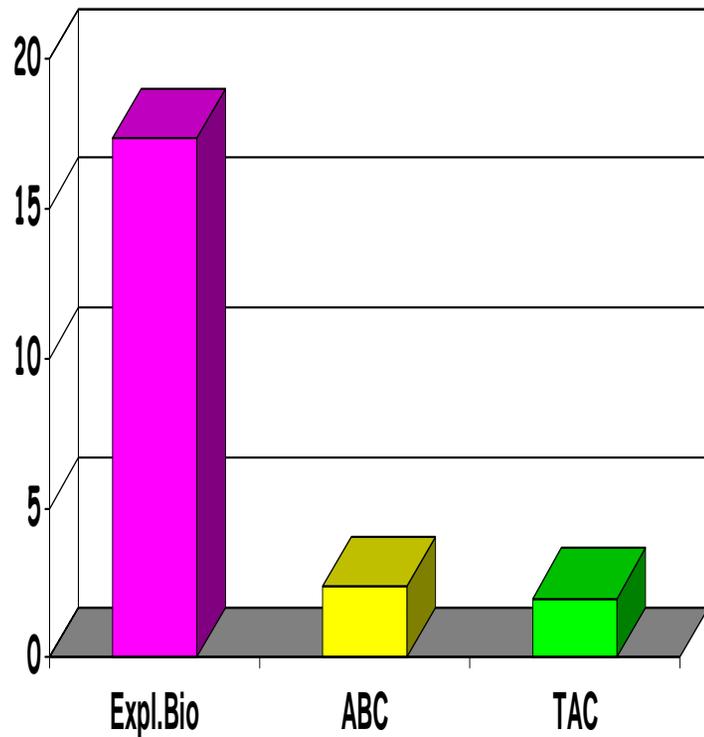
## Yr 1999 to Yr 2007



- **Exploitable Biomass**
  - 17.336 mmt for Yr 2007
  - High but declining for Pollock, Cod
- **ABC**
  - 2.291 mmt for Yr 2007
  - Slightly higher than the OY cap of 2 mmt

# Summary Assessment in December 2006

(Applicable for 2007 Fishery)



- **Exploitable Biomass = 17.336 mmt**
- **ABC = 2.391,435 mt**
- **Max TAC = 2 million mt**
- **Is any Stock being overfished or approaching overfishing Situation ? – No and No for all the Stocks below Tier 5 Analyses**
- **Cannot determine situations for Tier 5 and Tier 6 stocks**